AUGUST 31, 1944

American Machinist

How "Tin Fish" Are Made

PRODUCTION OF TORPEDO CENTER SECTIONS AND PROPELLERS

By the Time You've Smoked a Cigarette...*

THE HEALD NO. 81 CENTERLESS grinds 14 to 16 bearing races to within .0003" *Automatically!*

*Your average time in smoking a cigarette—5 minutes. Your Heald No. 81 Centerless on 1" I.D. ball bearing inner races turns out 190 per hour.

Those bearing races could also be valve seats or roll bushings or sleeves ...in fact almost any piece where the bore must be concentric with the outside diameter.

You can turn out all such parts on a Heald Centerless Grinder—at high speed—to close tolerances—*automatically!* The operator simply puts pieces to be ground in the loading chute—then location, grinding, gauging and unloading proceed entirely automatically.

A study of your problem may bring to light several operations that can be done at lowest possible cost by switching to a Heald Centerless Grinder. For the first step in finding the answer, send for our interesting 24 page booklet describing No. 81.

★ ★ ★

And remember, the Heald Centerless is just one of the *Precisioneering* Family of grinding and borizing machines. Heald Engineers with a thorough knowledge of your field are ready to help solve your production problems—for now and after Victory. They make available a wealth of war-proved precision finishing methods and machines—that offer greater output—better products—at less cost.

THE HEALD MACHINE CO.
WORCESTER 6, MASS.

AUTOMATIC GRINDING CYCLE

1. Work automatically loaded.
2. Table carries work to grinding position.
3. Pick-up feed makes rapid wheel contact.
4. Change to proper roughing feed and speed.
5. Change to semi-finishing feed and speed.
6. Work withdraws, trued at truing speed.
7. Change to finishing feed and speed.
8. When size is reached, all units go to rest position.
9. Work is ejected into unloading chute.

HEALD *for precision plus ...economy plus*

Internal and Surface Grinding Machines • Bore-Matic Precision Finishing Machines

American Machinist

August 31, 1944

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From _____

_____

To _____

_____

Signed _____

American Machinist Chips

Report on Robot Bombing . . . No doubt you saw in the August 3 issue of *American Machinist* the news story by Bill Hargest, our new war correspondent in London.

The New York Times of July 29, in carrying the account of the robot blast that caused such havoc in an English restaurant, said that Bill's description of the mechanism of the robot bomb was the most complete to reach New York.

A letter just received enables us to tell you of another bombing, a story which had heretofore been censored. The war came close to us when a robot landed very much in the immediate vicinity of McGraw-Hill's London office, Aldwych House. Now it can be told, and we'll let Brother Hargest tell it in his own words:

"Let me just state that everything is shipshape again, although the building is still in a very bad mess. The office carried on without missing a beat, spending but two days to put things right. All the editorial staff moved to the ground floor, and here we are with desks interspersed between cases of books and book racks, and beating out "The Machinist" *without so much as missing one trip to the printer with copy. It wasn't as easy as it sounds by any means, but I thought you would like to know that it was done. The same thing applies to the book department, circulation and advertising departments."*

Several issues ago on this page, we cautioned Bill to "take care of himself." Little did we dream!

Amphibious Saga . . . This column has never set itself up as a book review department, but here's an item generated by sheer enthusiasm.

We have just read "By Sea and By Land" by Lt. Earl Burton, USNR. It is the story of our amphibious forces . . . from the days when we had no such up to our recent multitude of successive sea-borne invasions.

It seems incredible that as recently as 1939 our men had to get basic amphibious training on dry ground—with Army trucks simulating assault boats and a row of stakes designating the "enemy" beach. Compare it with the complex pattern of Army-Navy cooperation that is making possible our present brilliant successes in this phase of warfare, and you have a thrilling story of American courage and ingenuity.

The book is at one time an interesting historical document, an absorbing insight into military planning and operation and a fascinating yarn.

This is not a commercial plug, but it happens to be published by Whittlesey House, McGraw-Hill Building, New York 18, N. Y.

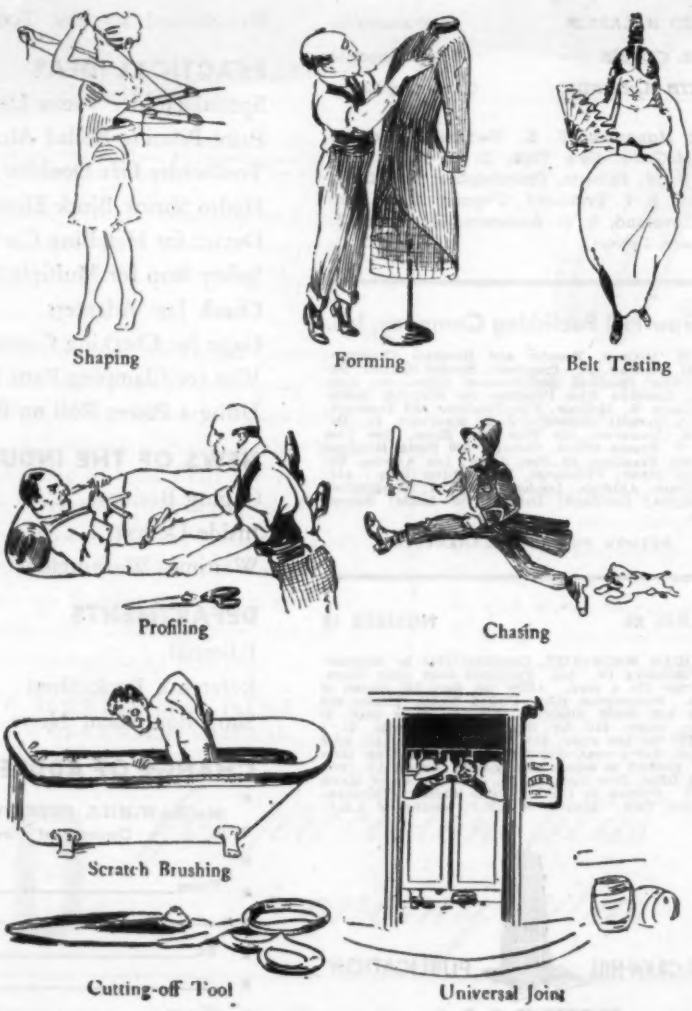
Nostalgia . . . Digging deep into our old files for scrap paper, we ran across something that stirred the memory.

It was a little booklet dated October 23, 1913—called the "Potash & Perlmutter Edition of *American Machinist*." The happy custom in those days, when machine tool builders were a relatively small and closely-knit group, was for *American Machinist* to entertain the boys at an annual theater party. As we recall, our contemporary *Machinery* did their share of the honors with a boat ride.

On the night of October 23, 1913, the show was Potash & Perlmutter at the Cohan Theater, New York. The above booklet was by way of a program and included a Potash & Perlmutterish burlesque on machine business and advertising.

Shown below are some illustrations from the booklet. Anyone remember? Them was the good old days!

Machine Shop Terms—Illustrated



BEVEL GEAR DRIVES — TO *Victory*

Ground curved-tooth bevel gears . . . for controllable pitch propellers in all types of fighting planes.

EXTRA POWER FOR EVERY EMERGENCY

By varying automatically in flight the angular direction or pitch of the propeller blades, controllable pitch propellers make possible the most efficient aircraft engine operation under all conditions . . . take-offs, speedy climbs, sharp banks, swift power dives or high altitude dog fights.

GROUND CURVED-TOOTH BEVEL GEARS PROVIDE INSTANTANEOUS, PRECISE FEATHERING OF ALL BLADES

Bevel gears are naturally used as the means of pitch control. A central bevel gear engages bevel pinion segments on the inner end of each blade shaft. Any slight rotation of this central gear in response to variations in power requirements instantly changes the pitch of each blade in the same amount.

The conical form of bevels allows assembling without backlash by the individual axial adjustment of each pinion. This decreases the likelihood of vibration and insures instantaneous changes of pitch as required.

Curved-tooth bevel gears possess localized tooth contact which compensates for minor deflections of the gears in operation. The hardened and ground tooth surfaces of these gears provide in a light-weight compact unit the strength to carry the torque and the accuracy to maintain uniform pitch of all blades.

CUT AND GROUND ON GLEASON MACHINES

These precision gears are cut on the No. 16 Machines and ground on the No. 17 Hypoid Grinder at high production rates.

This is just one illustration of the many uses of bevel gears in aircraft, which offer a promise of continually improved operation for the airplanes of the future.

GLEASON

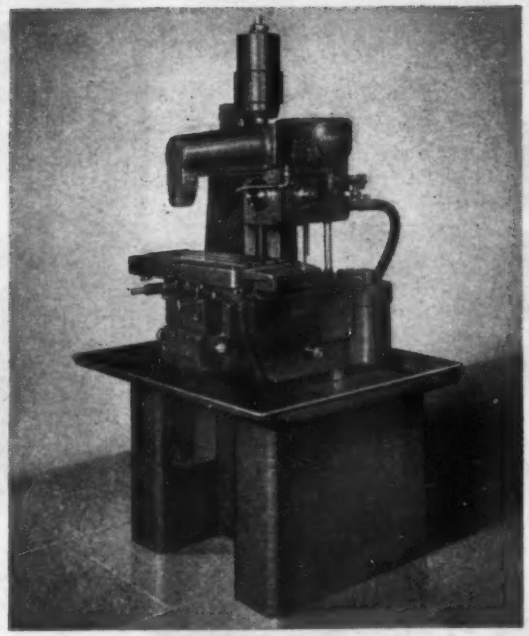
GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

Shown at the right is a CINCINNATI *0-8 Automatic Rise and Fall Milling Machine. Catalog M-964-1 gives complete details.*

CINCINNATI



DUPLEX CUTTER HEAD AND TWO STATION FIXTURE

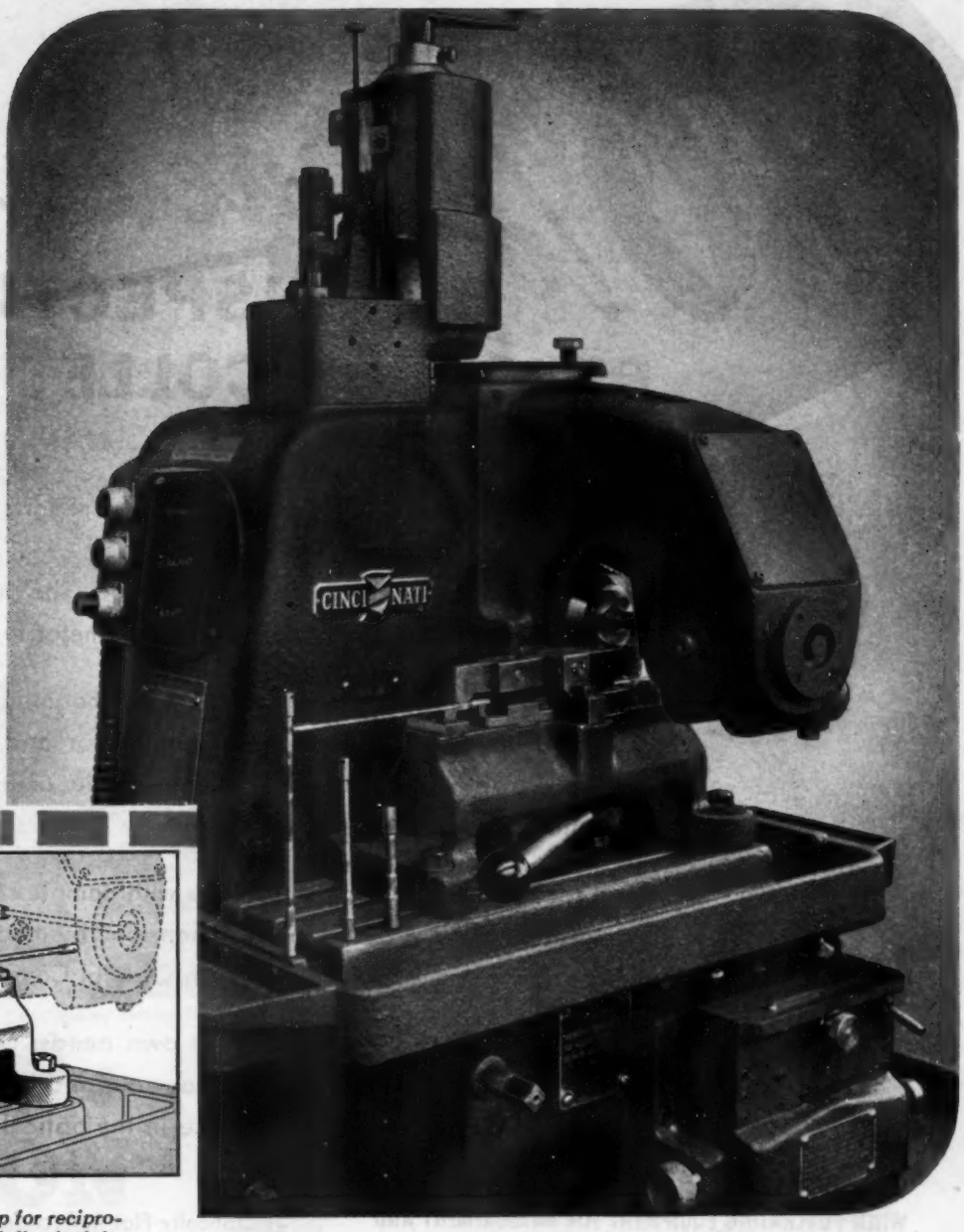
INCORPORATES RECIPROCATING MILLING WITH RISE AND FALL PRINCIPLE

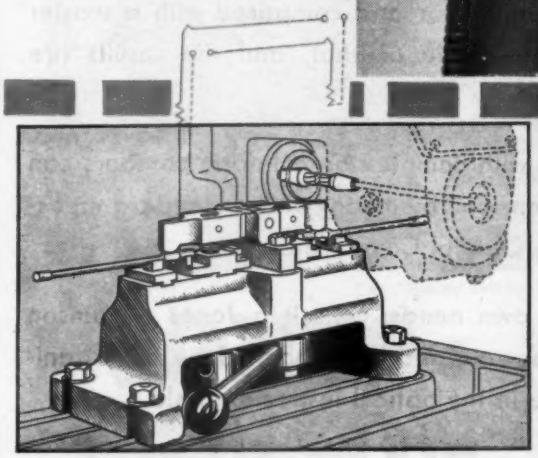
This setup on a CINCINNATI 0-8 Automatic Rise and Fall Miller introduces a new idea in reciprocating milling . . . using the vertical feed to automatically mill two opposite flats at the same time, finishing two parts per cycle. The fixture is a two-station type with clamping elements actuated by a single interchangeable lever from beneath the fixture. As one part is milled the second station of the fixture is unloaded and loaded. The operator simply flips the starting lever and the machine goes automatically through the operating cycle. ¶ While this setup was developed by CINCINNATI Application Engineers for milling a stud used in certain types of armament, its counterpart may be found in many operations necessary for the manufacture of consumer goods. It will pay you to talk over your postwar milling problems with the engineers here at Milling Headquarters. ¶ Complete details of CINCINNATI 0-8 Automatic Rise and Fall Milling Machines will be found in specification catalog M-964-1. A copy will be sent on request. For a brief description of all CINCINNATI Milling Machines look in Sweet's Catalog File for Mechanical Industries.

Keep on buying WAR BONDS

THE CINCINNATI

MILLING MACHINES





The above sketch shows setup for reciprocating milling with Rise and Fall principle. The machine is a CINCINNATI *0-8 Automatic Rise and Fall Miller. Diagram of automatic cycle is shown in color. Note stop position in the center of the cycle, a safety feature for the operator.*

Above: CINCINNATI *0-8 Automatic Rise and Fall Milling Machine equipped with special duplex cutter head, with 1 to 1 spindle speed ratio, and special two-station fixture. The operation consists of milling two opposite flats on stud.*

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

Time saved...

INSPECTING HIGH PRECISION COLLET HOLDERS

The manufacturer of these collet holders reports "a time saving of eighty percent (80%) over the method formerly used - - - ", when a Jones & Lamson Pedestal Optical Comparator was installed. The angles are held to limits of ± 15 minutes of arc, and the straight diameter to ± .001".

Through a highly precise lens system, a magnified shadow of the part is projected upon the screen of the Comparator and compared with a master outline drawn upon the glass. It's as simple as that, and the results are accurate beyond a shadow of a doubt.

Form tools, gages and other products with complex or multiform contours can be checked and measured in all dimensions by means of the standard measuring attachments of Jones & Lamson Optical Comparators.

For the method best suited to your own needs, consult a Jones & Lamson inspection engineer. There is one near you, and he is backed by an organization with over 20 years experience in the optical inspection field.

WHEN PURCHASING EQUIPMENT FOR MEASUREMENT AND INSPECTION BY OPTICAL PROJECTION, YOU SHOULD DEMAND:

1. Precision Condensing Lens System for controlling light.

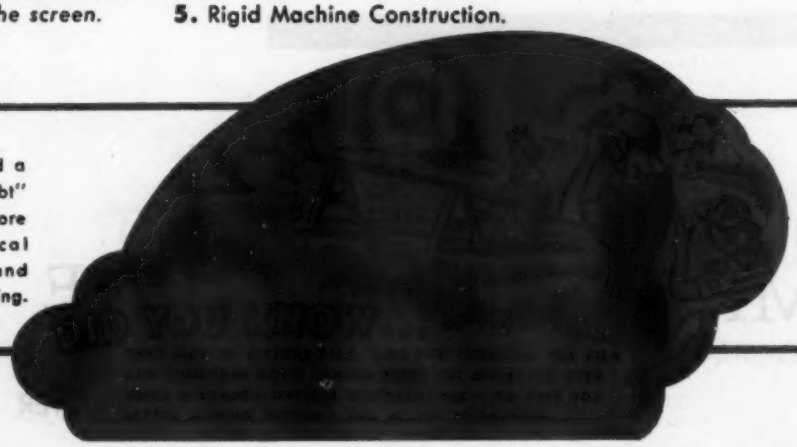
2. Projection lenses that project a sharply defined image, free from distortion and color, *anywhere on the screen.*

3. Optically Flat Reflection Mirrors *sufficiently thick* to insure *permanent* flatness.

4. Provision for positively aligning the illuminating system, staging fixtures, projection lens, mirror and screen in correct relation to each other.

5. Rigid Machine Construction.

This book "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.



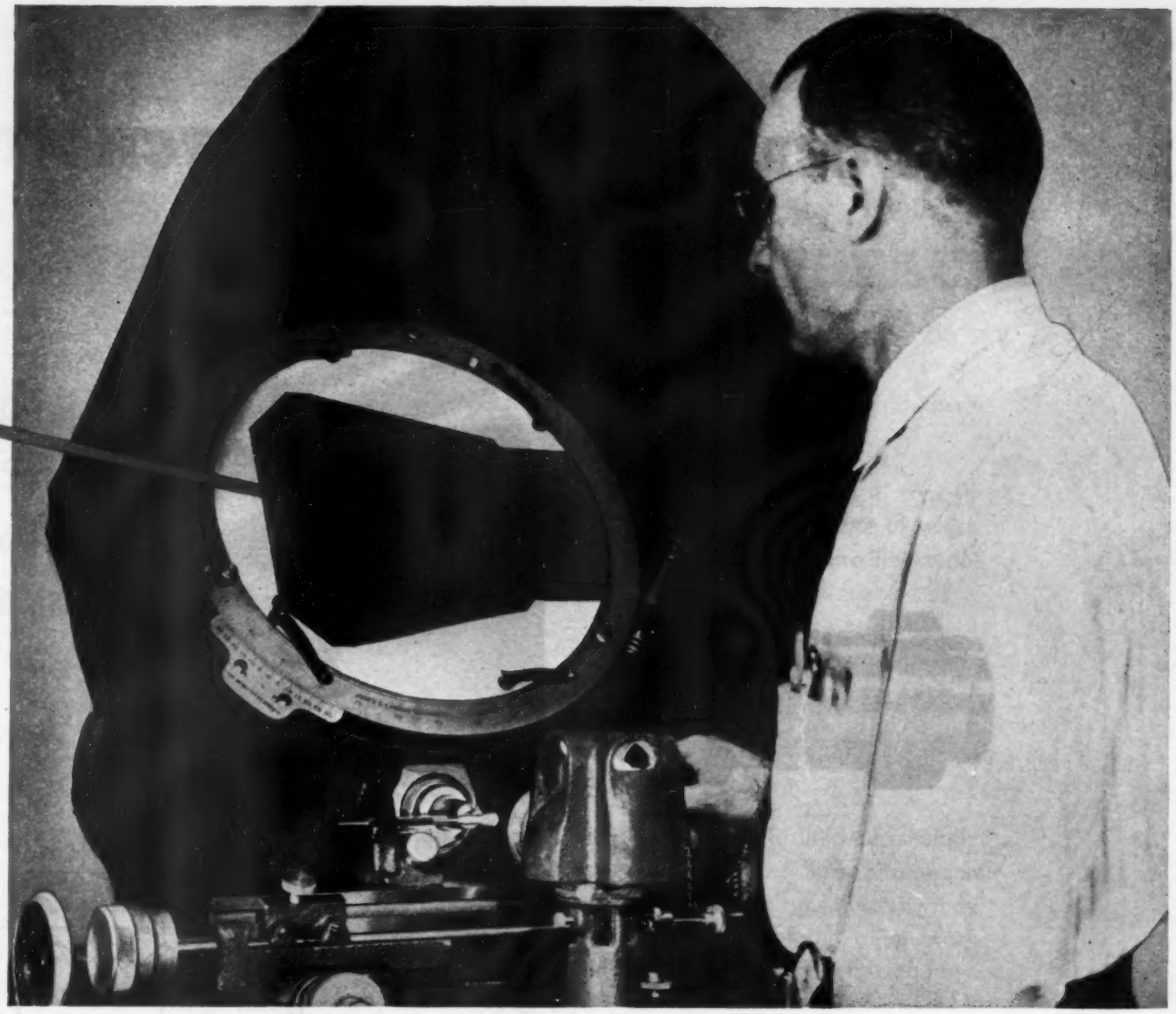


Photo courtesy The Arc Equipment Corporation, Bryan, Ohio

JONES & LAMSON

MACHINE COMPANY

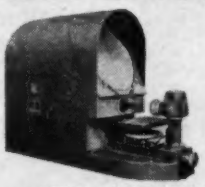
SPRINGFIELD, VERMONT, U. S. A.

OPTICAL COMPARATORS

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

BENCH COMPARATOR WITH 14" DIAM. SCREEN & MEASURING ATTACHMENTS

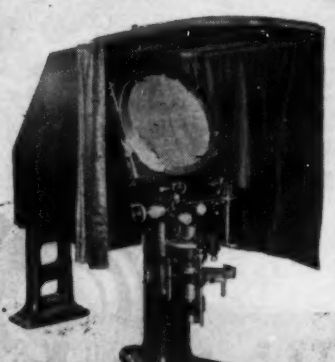
STANDARD BENCH COMPARATOR



BENCH COMPARATOR 14" DIAM. SCREEN

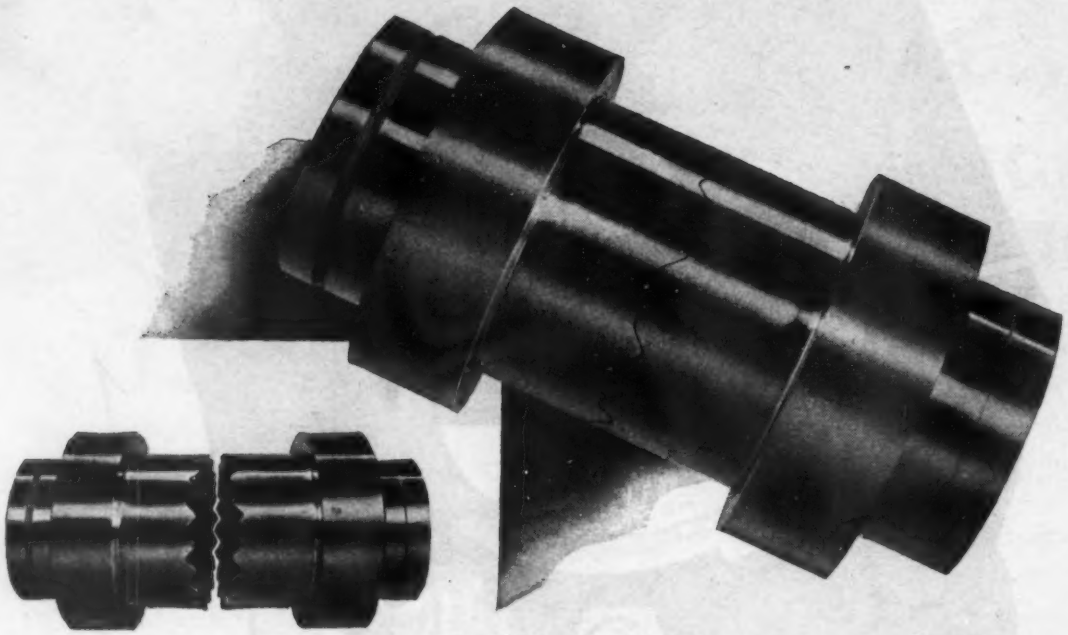
DIRECT PROJECTION COMPARATOR

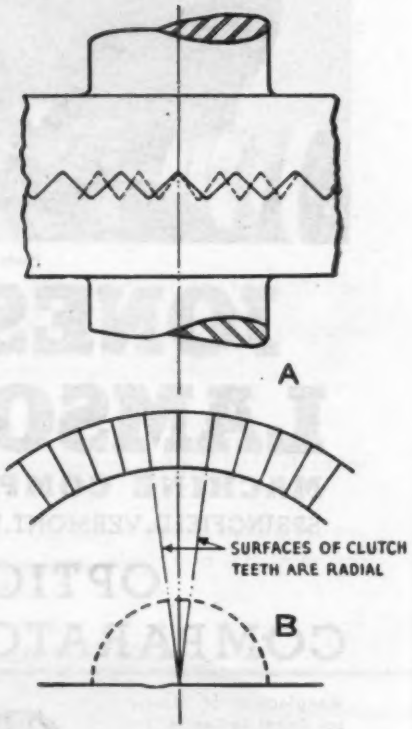
STANDARD PEDESTAL COMPARATOR



PEDESTAL COMPARATOR 22" — 30" DIAM. SCREENS

A GEAR-TYPE FACE CLUTCH





The essential fact which makes this difficult operation successful, is that the center line of the cutting tool is offset from the axis of the work, so as to bring the contact point of the tool directly over the center line of the work. The cutter-spindle carrying the single-point cutting tool is reciprocated, but does not rotate. At C and D, the cutting tool is advanced by the cam to generate the helicoidal surface *b*. At E and F, the tool travels in the opposite direction to generate the tooth face *e*. Arrows *a*, *c*, *d* and *f* indicate points of contact of cutting tool with work in various positions. B is a projection of the teeth at A, and shows that all elements on the sides of the teeth are radial with the axis of the work.

THE FELLOWS METHOD . . . MACHINES AND TOOLS FOR

WITH TEETH HAVING

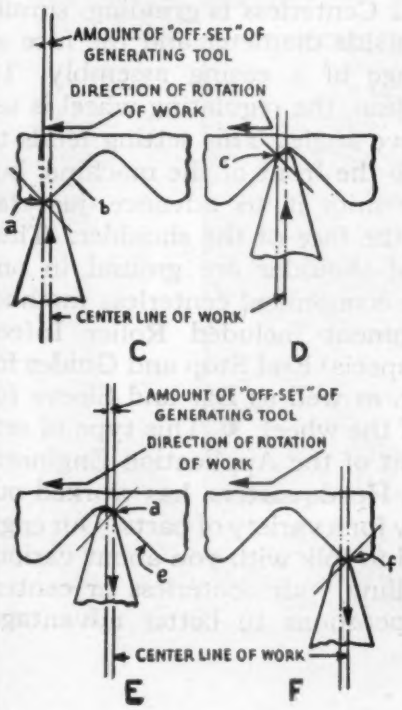
TRUE Helicoidal SURFACES

★ Cut on Fellows Gear Shaper equipped with a Face Gear cutting attachment

Here is still further evidence of Fellows Gear Shaper's cost-saving versatility.

The problem: to generate the tooth members of a gear-type face clutch, the teeth on both members of which must be in intimate contact over their entire helicoidal surfaces.

The solution: a special work-holding attachment and depth feed mechanism attached to a regular Fellows Gear Shaper. The job is done to precision standards, in faster time and at lower costs than could be accomplished with a special-purpose machine!



This job is one of many "extras" performed successfully by the Fellows Method. Today, Fellows Gear Shapers in your plant may be so busy on volume runs that you may never have had occasion to learn of the other work which it will do beside cutting gears. Next time you have a "special assignment", consult Fellows engineers . . . it may be that your Gear Shaper will be the solution to your problem. Write for literature. The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Bldg., Detroit 2, Mich., or 640 West Town Office Bldg., Chicago 12, Ill.

Fellows

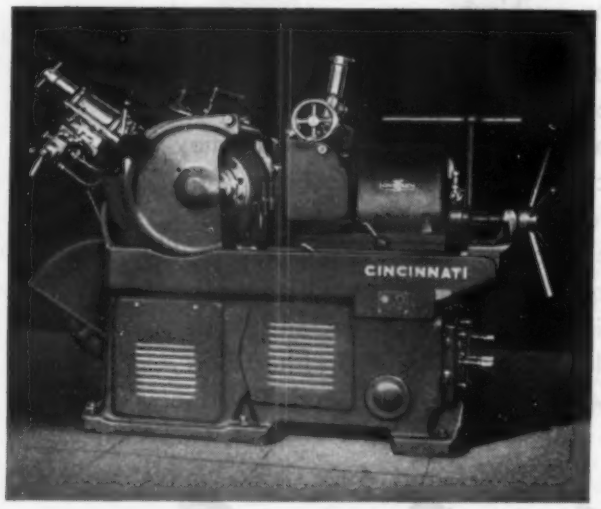
ALL OPERATIONS FROM BLANK TO FINISHED GEAR

DIAMETER AND SHOULDER

GROUND IN ONE OPERATION

BY THE

CENTERLESS METHOD



CINCINNATI *No. 2 Centerless Grinding Machine. Specification catalog G-456-1 contains complete details. Sweet's Catalog File for Mechanical Industries gives a brief description.*

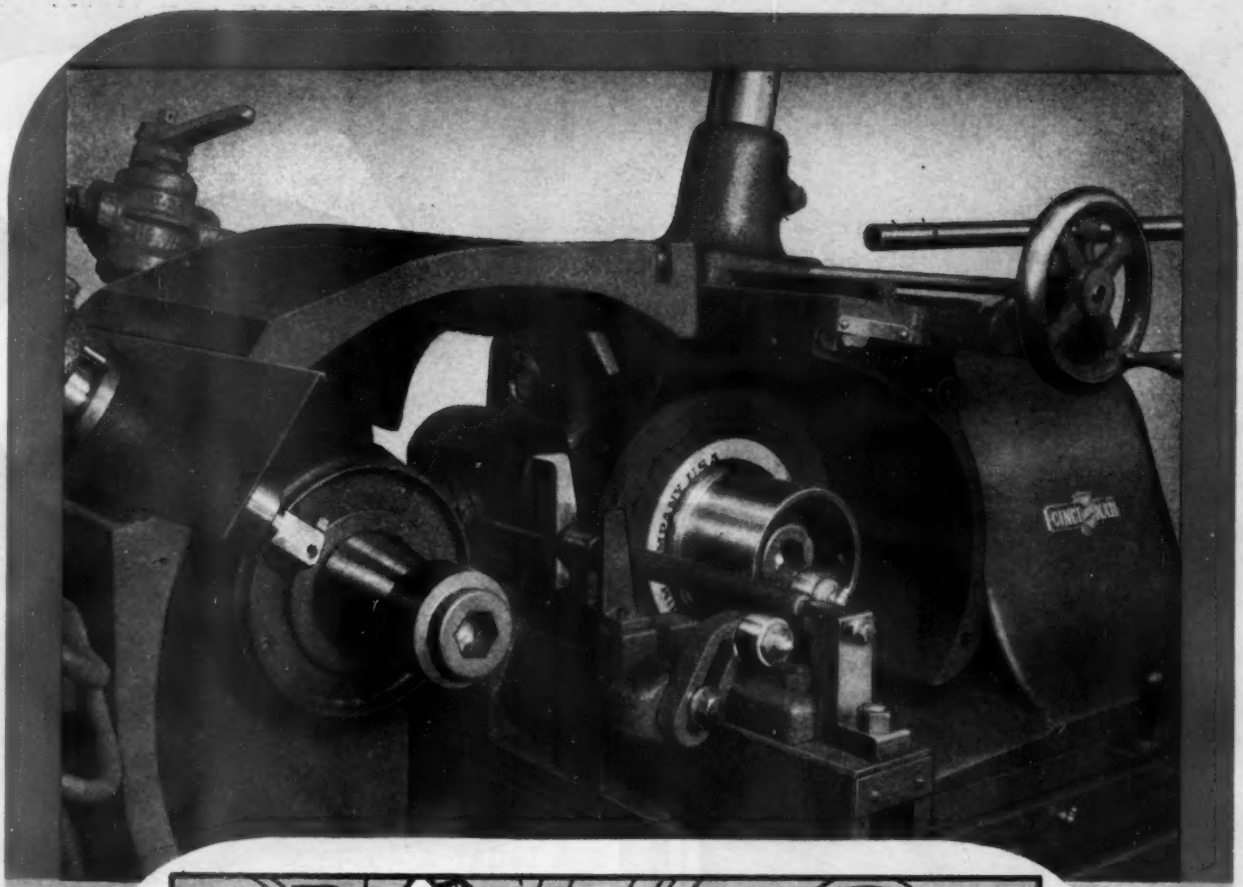
In the illustration on the opposite page a CINCINNATI No. 2 Centerless is grinding, simultaneously, the outside diameter and the face of an adjacent flange of a casing assembly. To handle the operation, the regulating wheel is set at a slight negative angle. This setting tends to move the work to the front of the machine, but the end stop permits it to advance just far enough to grind the face of the shoulder. Thus the diameter and shoulder are ground in one operation by the economical centerless method. The extra equipment included Roller Infeed Work Rest with special End Stop and Guides for loading the work, as well as Bar and Sleeve for truing the side of the wheel. ¶ This type of set-up, a development of the Application Engineers here at Grinding Headquarters, has worked out very satisfactorily for a variety of parts. Our engineers will be glad to talk with you about various methods of handling your centerless or center-type grinding operations to better advantage.

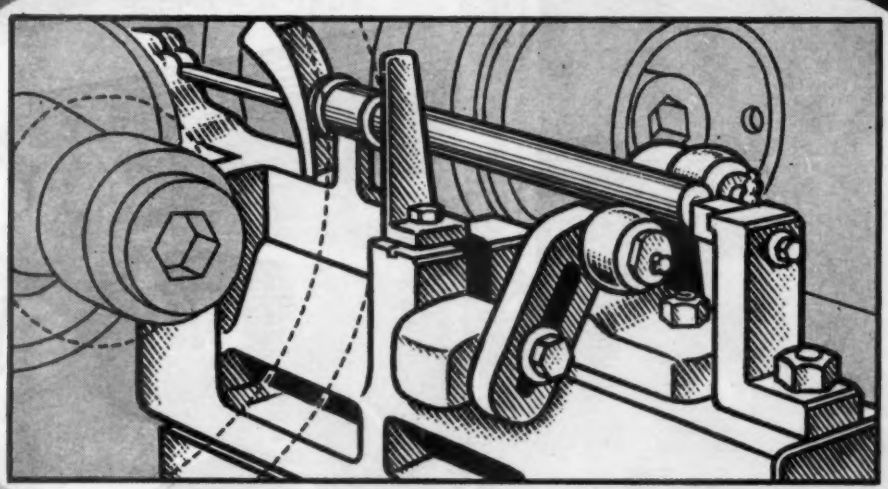
CINCINNATI

Keep on buying WAR BONDS

CINCINNATI

CENTER TYPE GRINDING MACHINE





In the photograph above the wheel has been removed to show the setup more clearly. The machine is a CINCINNATI *No. 2 Centerless. The sketch illustrates the special equipment and how the various elements of the setup function.*

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

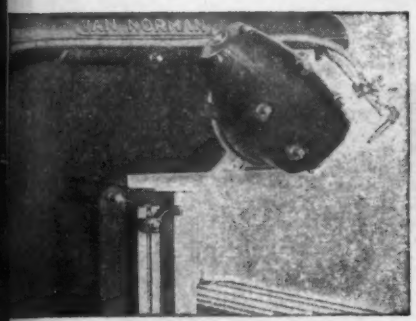
SPECIFICATIONS

No. 36 UNIVERSAL MILLER. Table 58" x 13", 1
speeds: 30 to 1500 rpm. 18 feeds: ⅛" to 32
Range: 35" longitudinal, 12" cross, 22¼" vertic

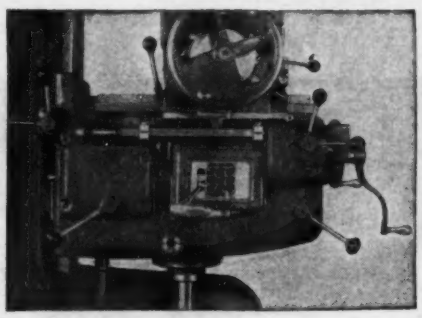
...IT PAYS TO

VAN NORMAN ADVANTAGES

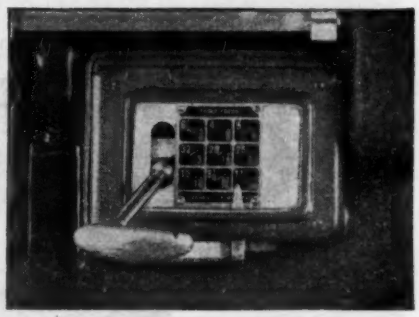
that speed up production on RAM TYPE UNIVERSAL MILLING MACHINES



1 ADJUSTABLE CUTTERHEAD



2 FRONT AND REAR DIRECTIONAL CONTROLS



3 SINGLE LEVER FEED SELECTOR

Van Norman Ram Type Universal Millers provide operators with three distinct operating advantages that increase work accuracy, minimize work reset-ups, lessen worker's fatigue and speed production.

1. The *adjustable cutterhead* gives you precision horizontal, angular or vertical milling by simply swinging the cutterhead to the desired milling position. This feature enables operators to perform most milling operations without changing the original work set-up. It saves valuable man and machine hours because there is no waiting for other types of millers to become available and changing the work from one miller to another is eliminated.

2. *Front and rear directional controls* of all power feeds, including the 6-way rapid traverse, enable the operator to operate the machine from either the front or rear of the machine thereby providing greater work visibility. These controls operate in the direction of the table, saddle or knee movement thus the operator always knows that the unit will move in the direction that the lever is positioned.

3. The *exclusive single lever feed selector* provides quick convenient selection of 18 feeds from 3/8" to 32" rpm. on No. 36 illustrated. The operator merely moves the selector lever up or down and right or left to the desired speed indicated by the coincidental pointer on the direct reading dial. A quick change speed selector, located on front of ram provides 18 speeds from 30 to 1500 rpm.

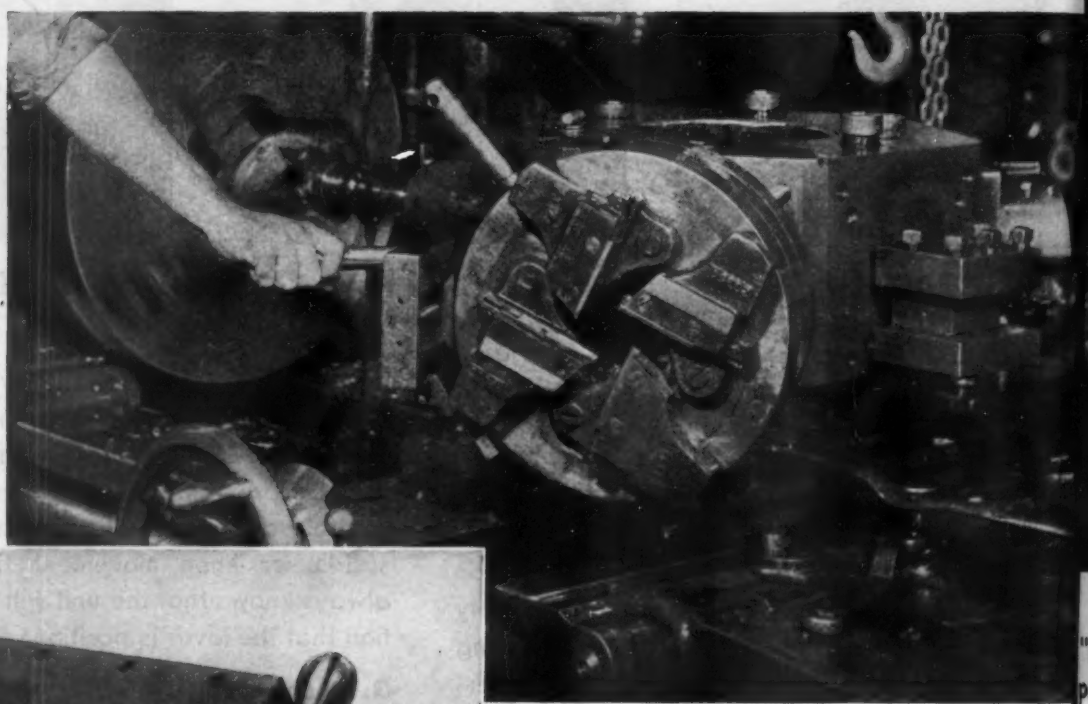
VAN NORMAN COMPANY

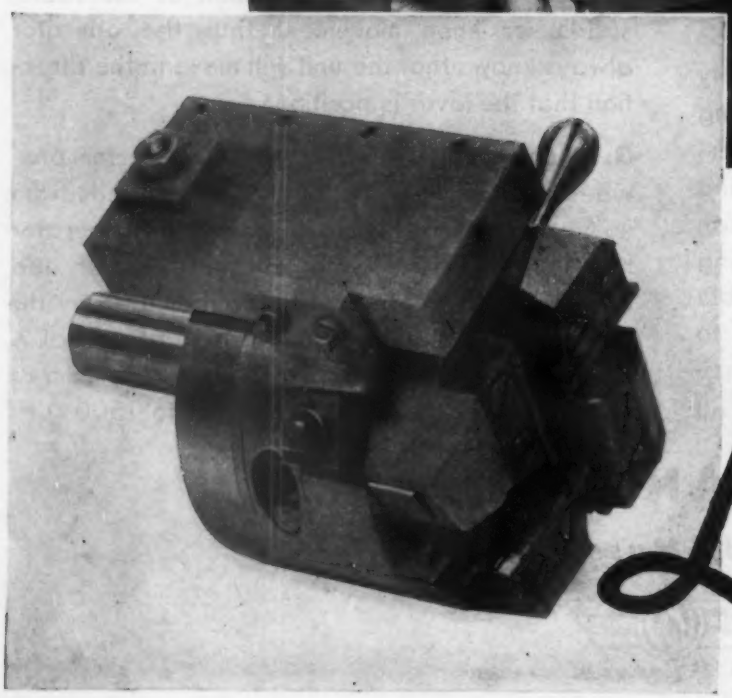
Springfield, Massachusetts

AN NORMANIZE

"The LANDMATIC HEAD Increased Production Over Other Methods Used" . . .

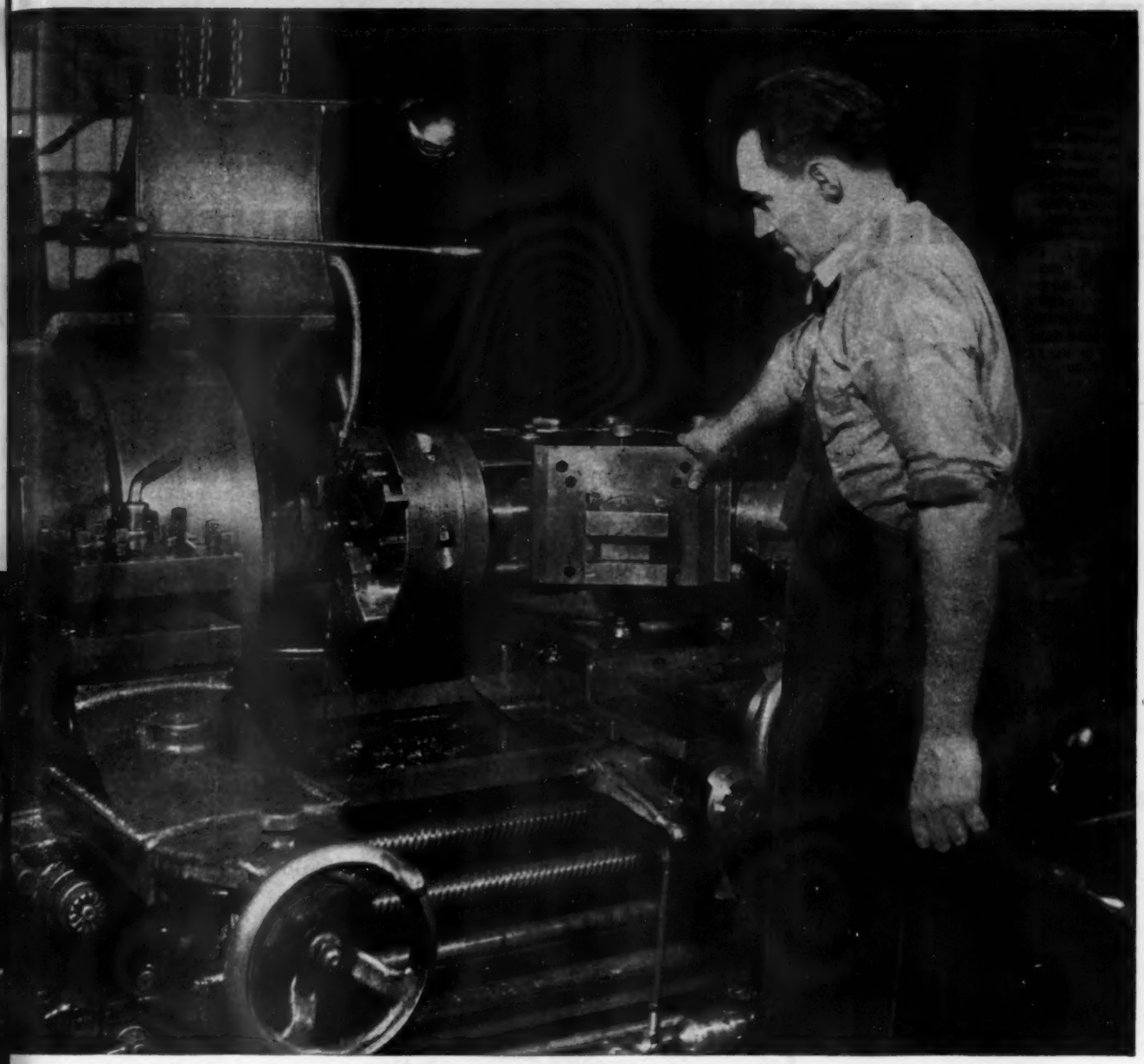
Writes Pittsburgh Manufacturer





4" Landmatic Taper Attachme Head producing valve part 200-250 threads per grin Threading time 12 seconds p piece.

Landis



"Due to the rigidity and design of this tool, we have increased our production over previous methods used. One of our chief troubles in the past has been to hold the lead and taper of our threads while running at high production speeds. This has been eliminated with your head. We are called upon to make standard and extra long length threads. The taper attachment is ideal for this purpose."

Write for Bulletin F-90

Machine Co.

WAYNESBORO, PA., U.S.A.

THIS *New Approach*

TO WHEEL AND COOLANT ENGINEERING

IS *Revolutionizing* GRINDING

PRACTICE AND RESULTS

QUAKER MICROGRIND PROCESS

applied to the grinding and honing operations in your plant, makes possible these specific benefits:

- Elimination of cracks on ground surfaces.
- Elimination of burns and distortion due to grinding.
- Much finer truly ground finishes.
- Greatly increased number of pieces obtained for each wheel dressing. (usually tripled)
- Immediate wheel life increase. (often 200% or 300%)
- Power consumption cut approximately 50%.
- Great increase in grinding production and virtual elimination of rejects.

A Quaker Process Engineer will welcome the opportunity to provide details and prove all the above claims *at our expense!*

QUAKER CHEMICAL PRODUCTS CORP.

CONSHOHOCKEN, PA.

Other Plants in CHICAGO and DETROIT Warehouse Stocks in Principal Industrial Centers

For details of the MICROGRIND PROCESS fill in below, tear out and mail.

A Progressive Organization of Research and Process Engineers and Manufacturing Chemists

Name_____ Position_____

•••PLEASE PRINT COMPANY NAME AND ADDRESS IN MARGIN BELOW•••

What you want to Know about ANPT Pipe Thread Gages

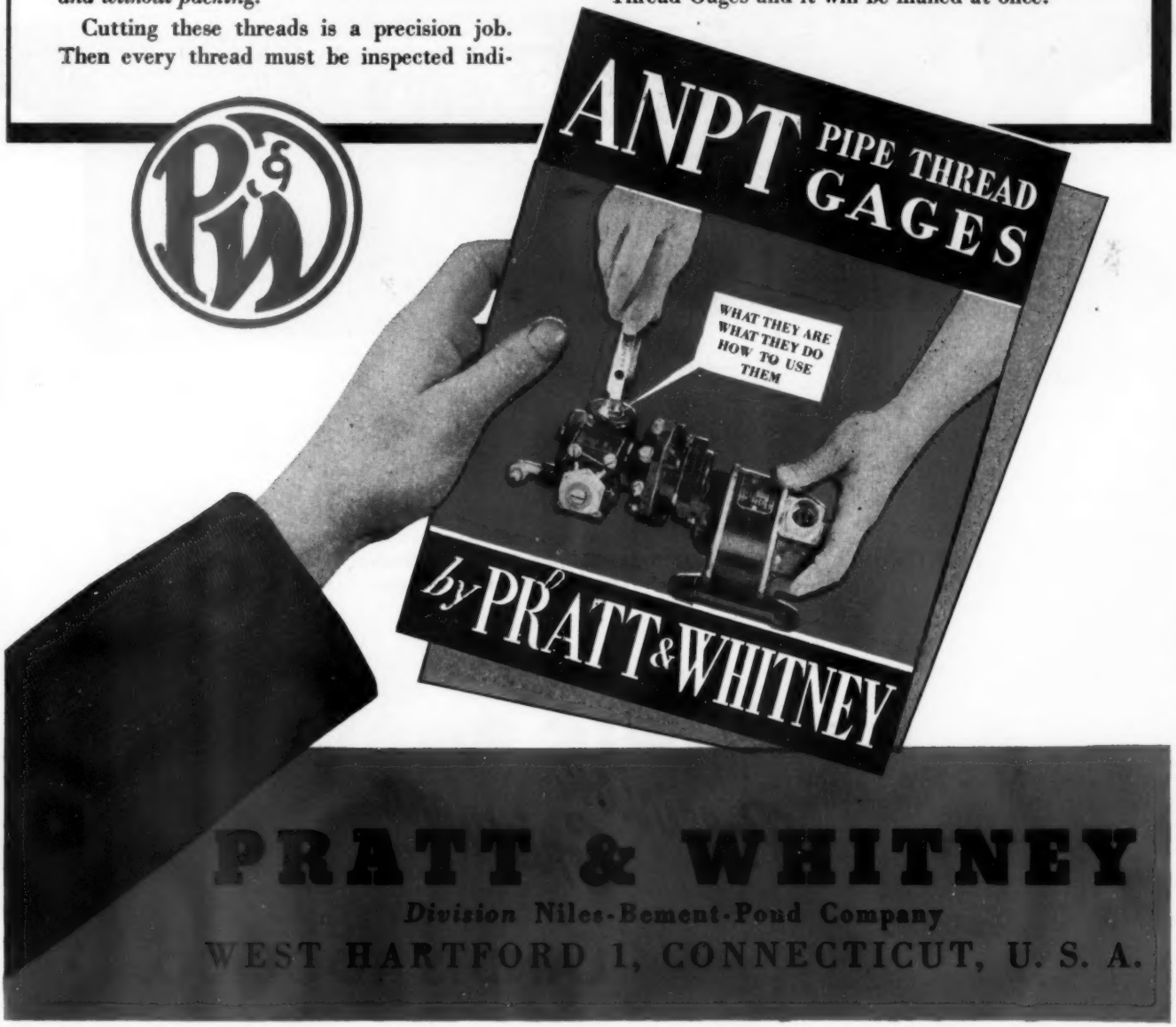
***What they are . . . What they do . . . how to use them. You'll find everything* in quick, complete, workable detail in this new P&W Booklet!**

American war planes have demonstrated beyond question their ability to absorb heavy punishment and still fly. One reason is the excellence of the threads in the aircraft pipe fittings that carry vital gas and oil. Army and Navy specifications for these threads are necessarily rigid. They must hold tight, never leak, never shake loose under vibration . . . *and without packing.*

Cutting these threads is a precision job. Then every thread must be inspected individually to make sure beyond any doubt that it will assemble *correctly* either here at home or on far distant flying fields. The lives of our American pilots depend on this inspection.

The new Pratt & Whitney ANPT (Army Navy Pipe Thread) Gages provide this quick and positive inspection . . . tell almost at a glance if a thread meets the rigid government specifications or should be discarded.

It's an important subject . . . complex to understand. But we have covered it fully in a form easy to grasp in this new Pratt & Whitney booklet just off the press. Simply write on your own company letterhead for a copy of our booklet on ANPT Pipe Thread Gages and it will be mailed at once.

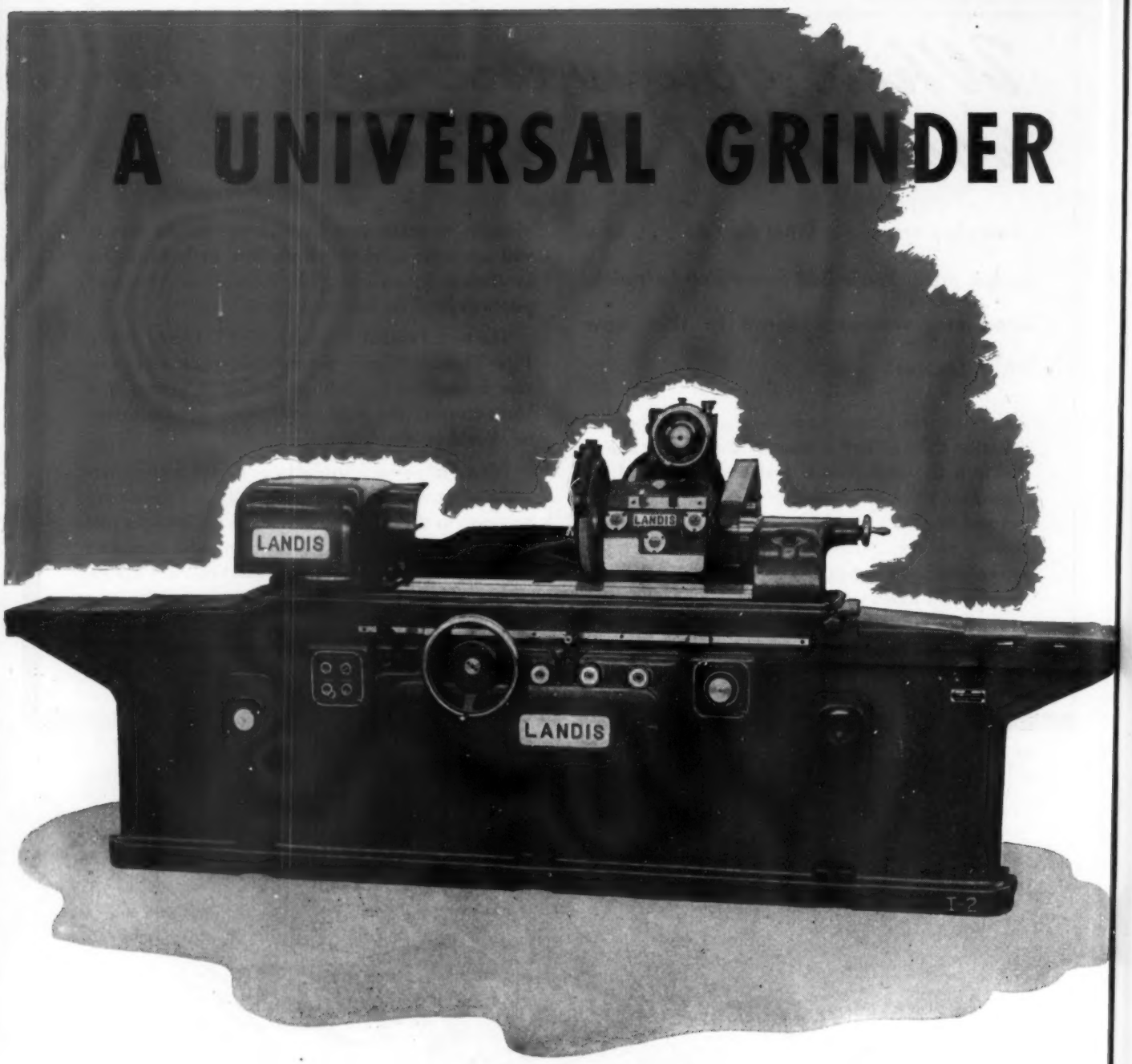


PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT, U. S. A.

A UNIVERSAL GRINDER



Landis 12" Type LCH Hydraulic Universal Grinder.
A full universal machine of medium capacity.

LANDIS TOOL
Precision Grinders

LANDIS TOOL CO.

FOR TOOL ROOM SERVICE

Simple to Setup
Easy to Change

- ★ Swivelling Headstock
- ★ Swivelling Wheelbase
- ★ Swivelling Worktable
- ★ Adjustable Speed Headstock
- ★ Hand and Automatic Wheel Feed
- ★ Two Speed Hand and Power Work Traverse
- ★ Removable or Swinging Type Internal Grinding Fixture

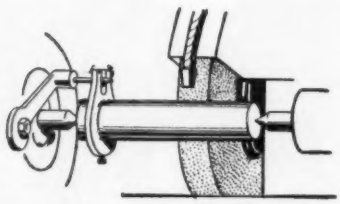
The many flexible adjustments of the Landis 12" LCH Hydraulic Universal Grinder cut set-up time to a minimum and make it easy to change from one job to another.

Regardless of whether the grinder is used for tool room work, machine repair or production, it will remove stock rapidly, produce a superior finish and work to an accuracy of one part in ten thousand. For further information write for our engineering bulletin. 8

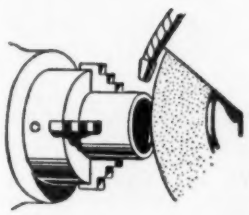
"Better Grinding" explains the basic principles of precision grinding. Invaluable for both the operator and the man responsible for grinding. Write for your copy today.

FOR A WIDE VARIETY OF JOBS

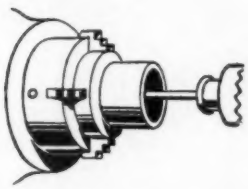
. . . mandrels, boring bars, jig bushings, dies, arbors—as well as production grinding.



CYLINDRICAL GRINDING



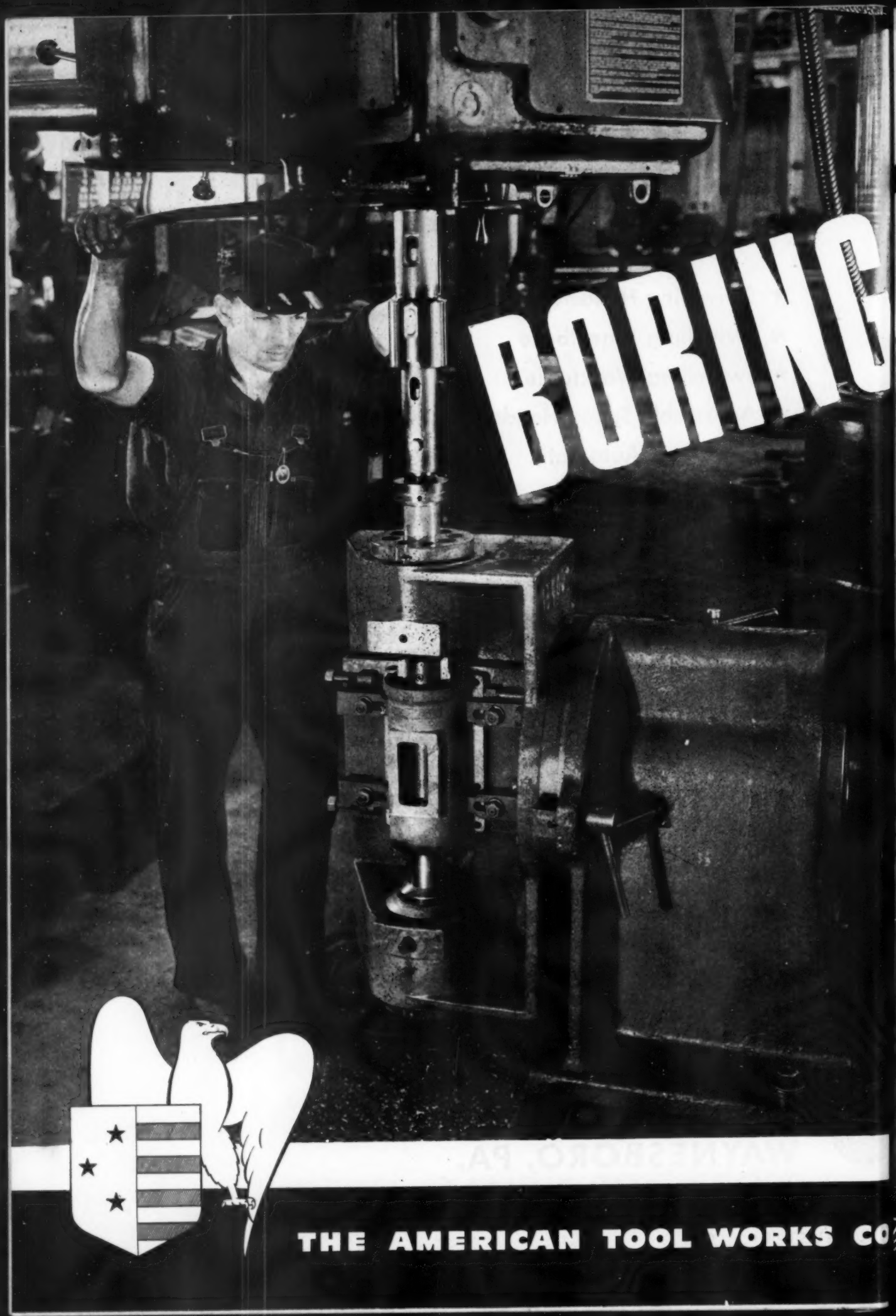
FACE GRINDING



INTERNAL GRINDING

LANDIS TOOL Company

WAYNESBORO, PA.



THE AMERICAN TOOL WORKS CO

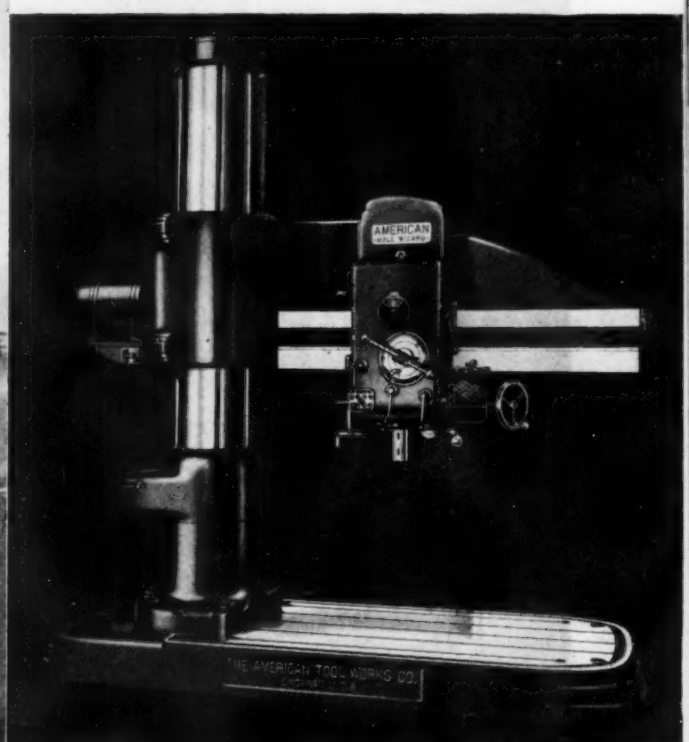
TECHNIQUE...

"American" Hole Wizard Radials are excellent boring machines.

These illustrations show the "American" Hole Wizard Radial boring 40 mm anti-aircraft gun worm housings through a two station jig mounted on an indexing trunnion stand.

The use of indexing trunnion stands brings the work to a comfortable working height for the operator which seldom is the case when stationary, base mounted jigs are employed, thus conserving the operator's energy and prolonging his efficiency.

For additional advantages offered by the combination of "American" Hole Wizard Radials and indexing trunnion stands, write for Bulletin No. 458.



Lathes and Radial Drills Cincinnati, Ohio U.S.A.

Outstandingly Successful for Many Jobs in These Fields:

Cylindrical Grinding

Centerless Grinding

Internal Grinding

Surface Grinding

Tool Grinding

Snagging

57 ALUNDUM ABRASIVE

. . . Another Norton Abrasive to Help You Meet Your Grinding Jobs More Exactly

Thoroughly tested—and never have field tests of a new grinding wheel been more successful in a half century of Norton experience.

Its use up to now has been restricted to critical war jobs, because of limited production facilities. Now, it is available for general use. Ask the Norton abrasive engineer about 57 Alundum, the latest of the Norton abrasives for grinding wheels.

Norton Co., Worcester 6, Mass.

Behr-Manning, Troy, N. Y., is a Norton Division

NORTON ABRASIVES

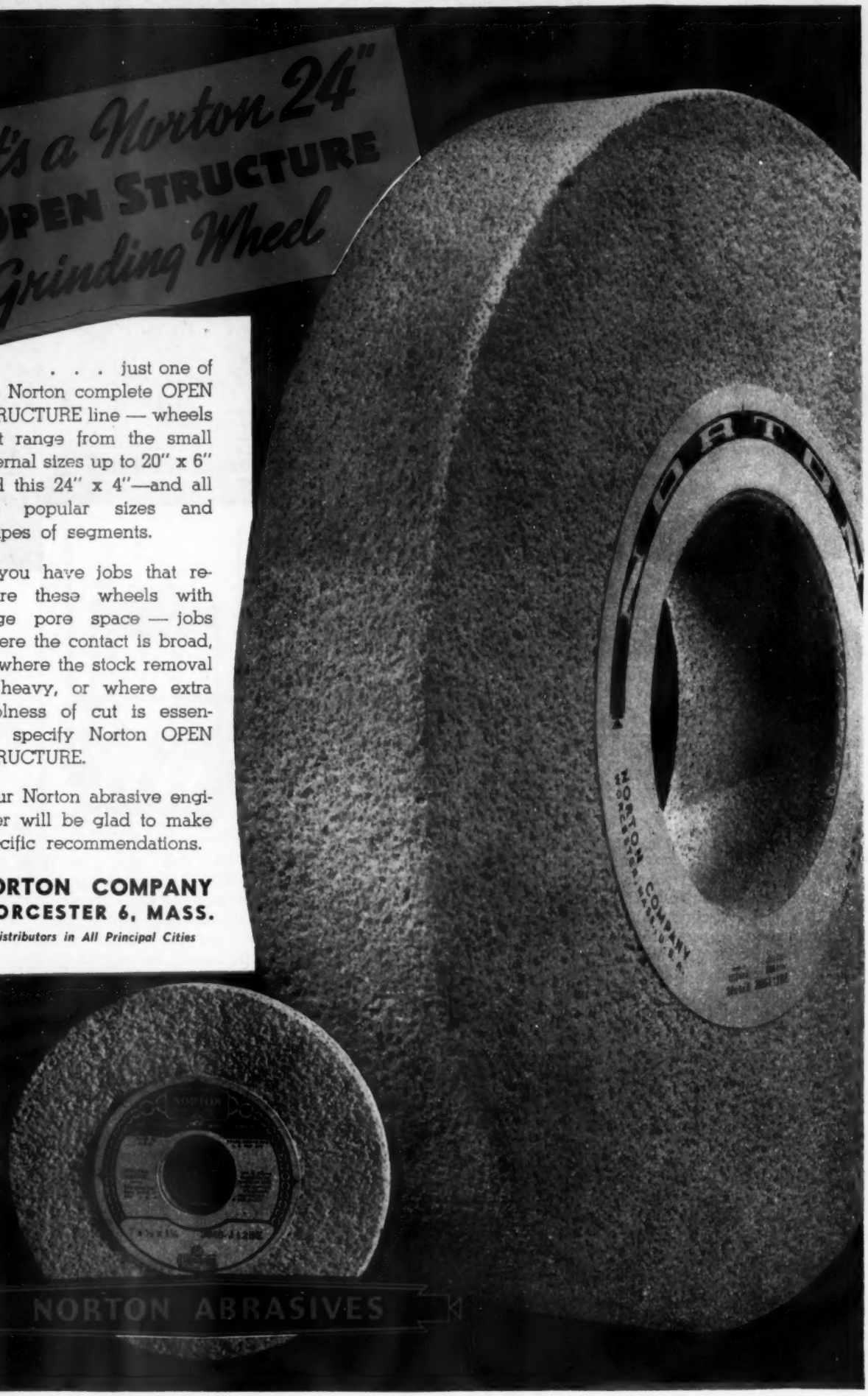
It's a Norton 24" OPEN STRUCTURE Grinding Wheel

. . . just one of the Norton complete OPEN STRUCTURE line — wheels that range from the small internal sizes up to 20" x 6" and this 24" x 4"—and all the popular sizes and shapes of segments.

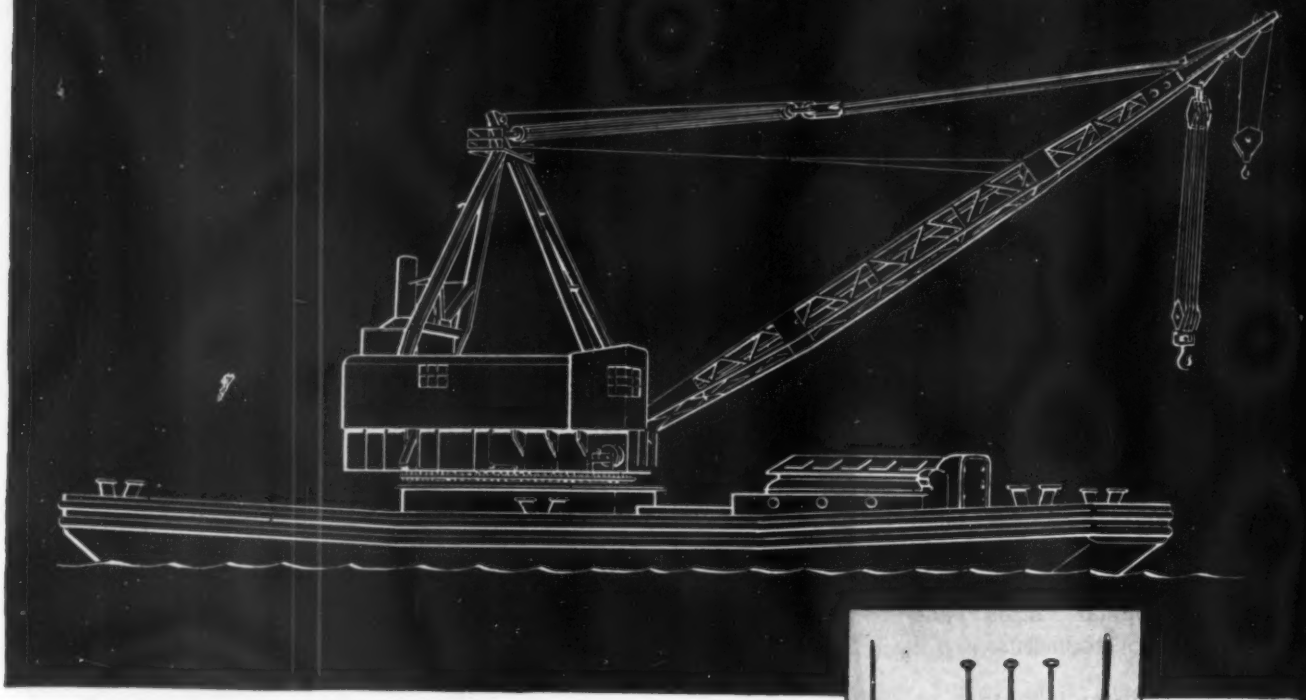
If you have jobs that require these wheels with large pore space — jobs where the contact is broad, or where the stock removal is heavy, or where extra coolness of cut is essential specify Norton OPEN STRUCTURE.

Your Norton abrasive engineer will be glad to make specific recommendations.

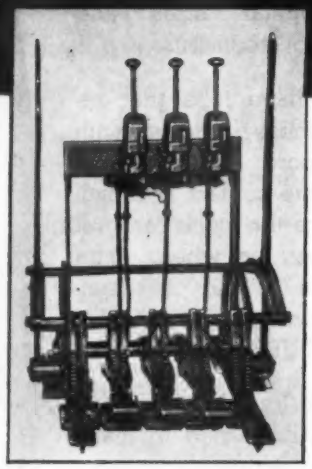
NORTON COMPANY
WORCESTER 6, MASS.
Distributors in All Principal Cities



GIVE W. A. B. CONTROLS A PLACE IN YOUR PLANNING



Boats that slug it out ... or sweat it out ... both use W·A·B Controls



Hard hitting, fast running fighting craft that slug it out toe to toe with the enemy and unglamorous work boats like this Army floating derrick, don't have a lot in common. But they are alike in one important respect—the need for responsive, dependable controls. W-A-B Controls are serving on both types of vessels.

On a number of different fighting ships, W-A-B Controls govern the entire cycle of engine maneuvering: speed regulation, clutching and declutching, application of shaft brakes, reversing of the engines, and synchronization or load balancing. The whole series is carried out merely by moving small handles through a small arc. On work boats, many of the operations involved in manipulating boom and hoist are handled in the same manner, and with the same ease and certainty.

Applications like this give a preview of the possibilities of W-A-B Controls for post-war use . . . and may suggest places where you can profitably apply the devices in improving your products, or stepping-up your production. When you are planning for the future, be sure to give consideration to the controls of the future.

Westinghouse Air Brake Company

INDUSTRIAL DIVISION

General Offices: Wilmerding, Pa.

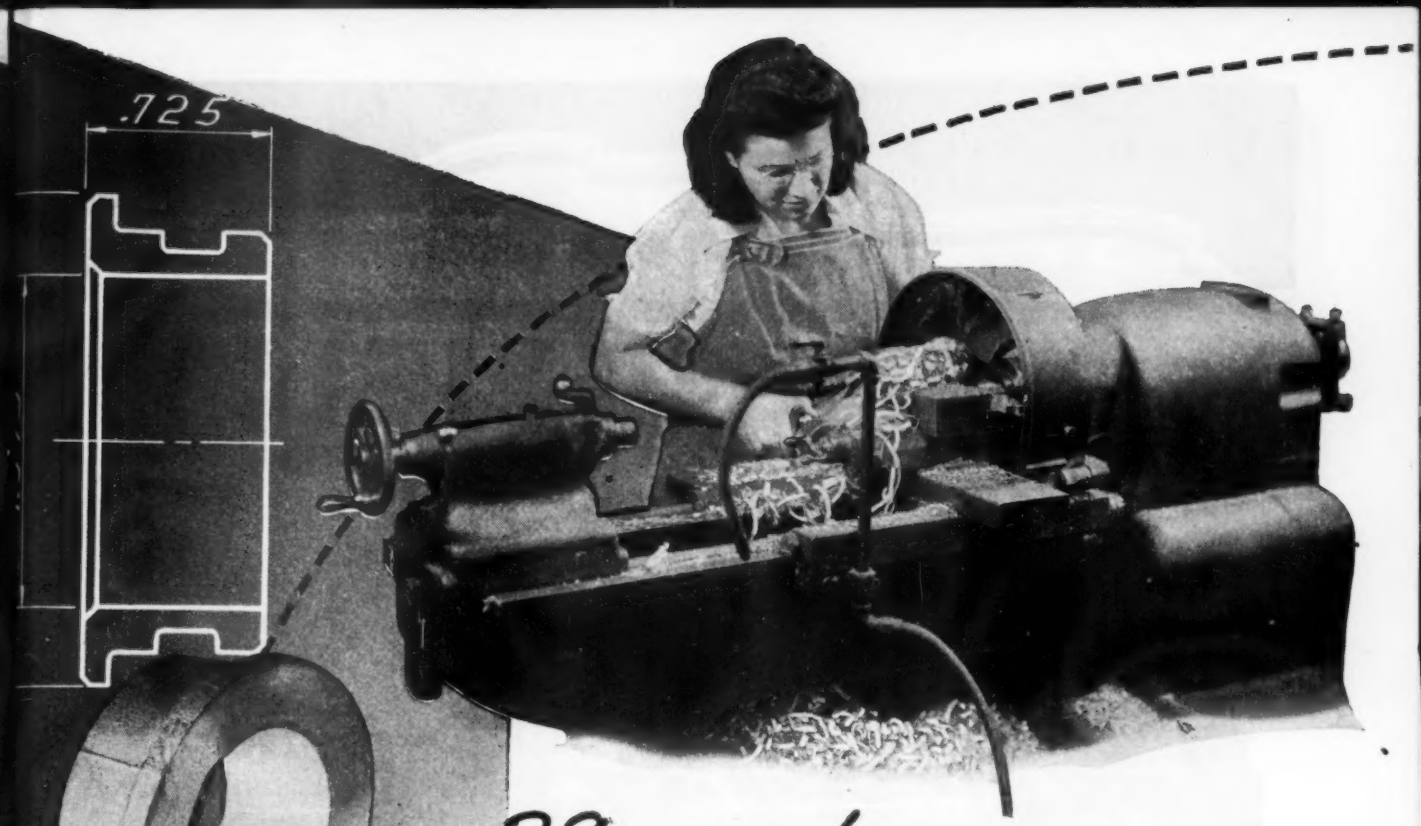
W·A·B

75 Years of Pioneering

1869 1944

Pneumatic · Pneumatic Electric · Pneumatic Hydraulic

remote control systems



38 seconds FROM FLOOR TO FLOOR

. . . AND FINISHED TO .0003"

Spindle speeds of 5,000 rpm permit fast machining of these aluminum aircraft bushings with high speed and close tolerances on Monarch 10" Production Lathes.

The first operation takes only 9 seconds cutting time to turn OD flange, face flange end, bore and chamfer inside and outside. Floor to floor time, 20 seconds.

The second operation, in 8 seconds cutting time turns OD, faces inside flange, faces small end, grooves and chamfers small end. Floor to floor time, 18 seconds.

Such high speed spindle operation is made possible by Monarch's improved lubrication of the precision spindle bearings, to permit cool, distortionless, high precision machining.

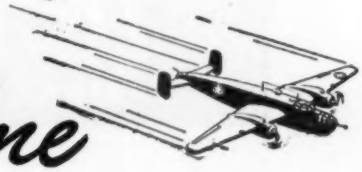
When war work is finished, these lathes will head the list for conversion to peacetime production. Stepless range of speeds, simple tooling, quick operating cycle and ease and speed of control will enable every machine and operator to turn more work per day . . . and keep costs down.

If you are interested in the cost-cutting possibilities of Monarch 10" Production Lathes, our engineers will work with you.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

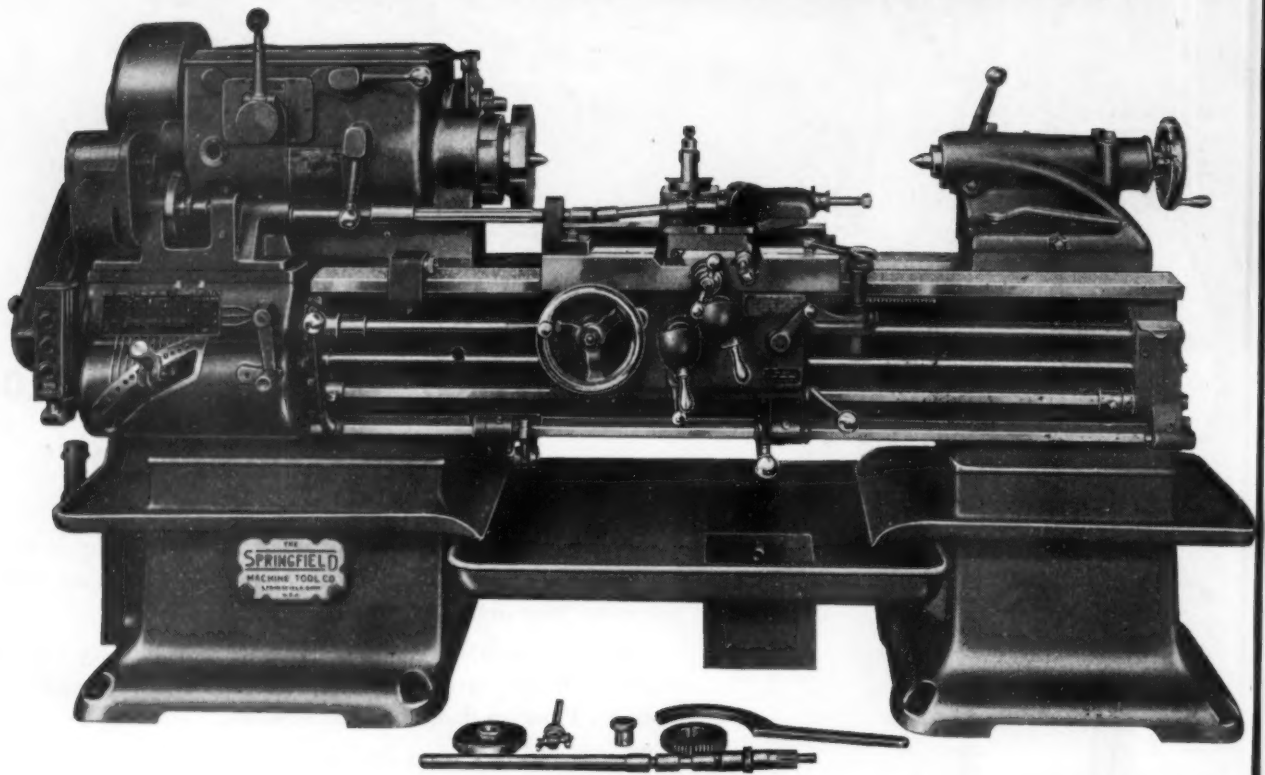
BRANCHES:

622 W. Washington Blvd., Chicago 6, Ill.
801 Fisher Bldg., Detroit 2, Mich.
512 Empire Bldg., Pittsburgh 22, Pa.
10465 Carnegie Ave., Cleveland 6, Ohio
635 Industrial Office Bldg., Newark 2, N. J.
Representatives in principal cities



Monarch Saves Time

Choose SPRINGFIELD



GEARED HEAD LATHES

From the ground up, a SPRINGFIELD Lathe represents superior construction and design. All heavy castings, including the bed, are cast in our own shop . . . gearing is designed for maximum efficiency . . . attachments demonstrate unusual engineering ingenuity . . . lubricating systems and power transmission are built to take it, 24 hours a day. In fact, to fully understand what SPRINGFIELDS can do for you, check their superior metal turning records in other shops . . . and judge for yourself.

Under current emergency conditions make it SPRINGFIELD Geared Head Lathe . . . they'll do your job better, now and later, too! Sizes range from 14" to 30". Write concerning deliveries, prices, etc.

The SPRINGFIELD MACHINE TOOL Co.

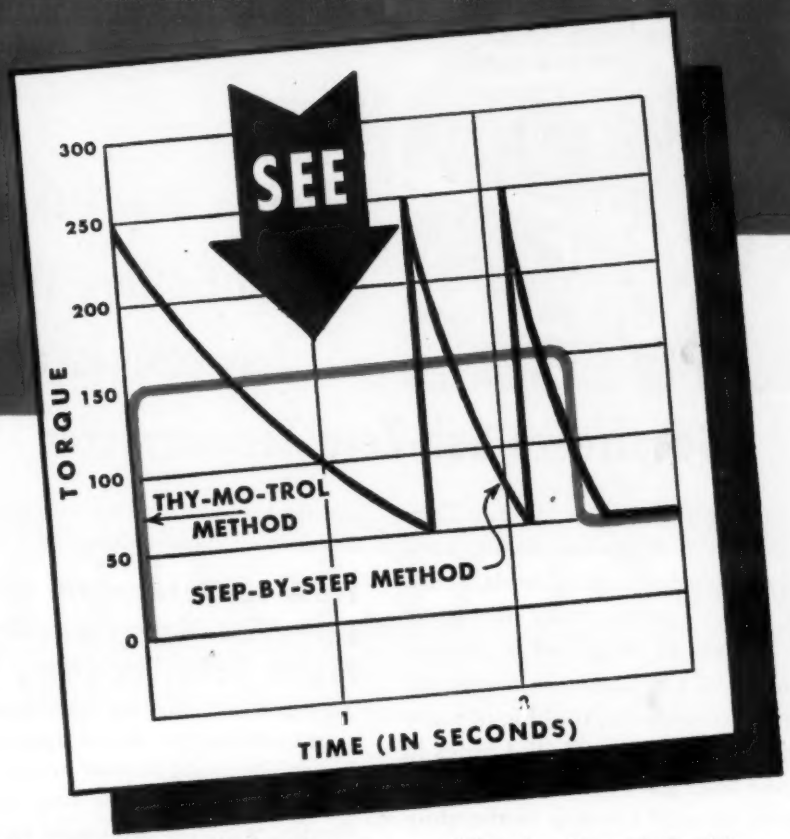
SPRINGFIELD OHIO U.S.A.

THY-MO-TROL DRIVE IS EASY ON YOUR MACHINES

ELIMINATES OBJECTIONABLE TORQUE PEAKS

PROVIDES SMOOTH, STEPLESS ACCELERATION

TORQUE CAN BE MATCHED TO THE LOAD



You may not be able to see what torque peaks do, but your machine feels them, and they may often cause serious damage. Thy-mo-trol drive does not produce the objectionable torque peaks that normally occur when step-by-step methods are used.

Thy-mo-trol's constant-current accelerating system limits the *maximum* current that can pass through the armature. During acceleration the current rises to the maximum value almost instantly, and is held there as long as it is required to accelerate the motor; after that, it drops off to the value required for normal operating conditions. Although acceleration is fast, it is also smooth—no starting shocks.

Matches Torque to Load

By using Thy-mo-trol drive, you can select the correct starting torque for your load. If the current limit is correctly set, there is no danger of damaging the machine by applying excessive torque when starting or accelerating, or during normal operation.

Completely Automatic

All the operator needs to do is to set the speed control and push the START button. Just make the necessary adjustments for the performance you want—Thy-mo-trol does the rest, *automatically.*

Rapid Starting

The electronic, constant-current accelerating system brings this drive up to speed in the shortest time consistent with the load.

A Complete Drive

Thy-mo-trol takes a-c power from your supply line and, through its d-c motor, delivers torque to your load. From a single, compact control station the drive is started, stopped, reversed, *and the speed adjusted.* Acceleration is electronically controlled. The motor is fully protected, and is stopped quickly by dynamic braking.

How to Buy Thy-mo-trol

Just give your nearest G-E office complete information about your requirements—nature of the load, speed range, horsepower, etc. Our engineers will select just the right Thy-mo-trol drive to give you the operating characteristics you want. *Standard* drives can be obtained in ratings from ⅛ to 20 hp—higher or lower if needed.

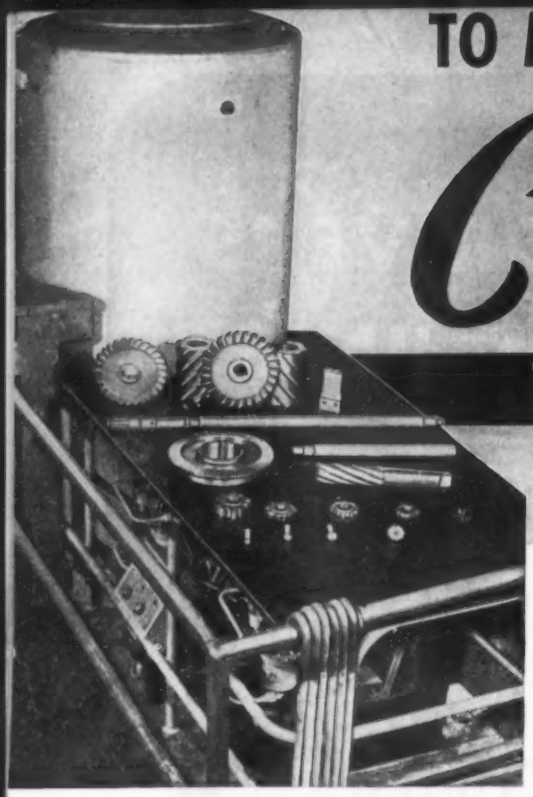
Want More Data?

You'll find more complete information in Bulletin GEA-4025. Ask our nearest G-E office for a copy. *General Electric Company, Schenectady 5, N. Y.*

Buy all the BONDS you can—and ***keep all you buy***

GENERAL ELECTRIC

TO MANUFACTURERS NOT YET USING *Cold Treating*



1 HARDENING OF TOOL STEEL

A few tools and machine parts cold treated in one plant are shown on the table of the Deepfreeze Cascade —120° F. Industrial Sub-Zero Chilling Machine.

2 SHRINKING OF METALS

Shrinking an airplane landing strut i Deepfreeze —120° F. Industrial Sub-Z Chilling Machine for shrink-fit assem Time reduced 50%—production doub

3 STABILIZING OF METALS

Stabilizing gauges and gauge blocks within .000002" in a Deepfreeze —1 F. Industrial Sub-Zero Chilling Machine.

4 TESTING OF INSTRUMENTS

Testing aviation instruments, metal and pl tic parts in a Deepfreeze Model D-70 Ind trial Chilling Machine to insure perfect op ation under stratosphere flying conditio

Here's How Others Are Getting the Advantages of Deepfreeze Sub-Zero Temperatures

● Deepfreeze Industrial Sub-Zero Chilling Machines are being used daily to harden cutting tools, stabilize gauges, shrink many steel parts for assemblies of various types, and to cold test aviation instruments and parts. For instance, tool life of high-speed drills, used to drill 4 holes in a yoke lever part, was increased over 500% by cold treating in the shop of one large machine tool manufacturer.

Equally remarkable results were obtained by using Deepfreeze sub-zero temperatures to stabilize gauge blocks and lapping flats, with the result of increasing their life 2000%. Another manufacturer uses a Deepfreeze Industrial Chilling Machine with automatic feed to shrink valve insert seats for engine blocks with a saving of $3,675 per year over the cost of dry ice. These are but a few of the many applications manufacturers are finding for Deepfreeze Sub-Zero Temperatures.

How to Determine What Benefits You Can Get From Cold Treating

To determine the exact benefits that your company can derive from applying cold treating to your production, consult the Deepfreeze Engineering Service, which is conducted expressly for this purpose. Your inquiry will not obligate you in any way.

Free . . . New Cold Treating Textbook

A new 40-page booklet containing complete up-to-date information on cold treating and including new procedures, applications, performance data stories, etc., has just been published and will be sent to you upon request. Write for Bulletin No. 1-4.

Only Motor Products can make a "DEEPFREEZE"

Deepfreeze

2327 DAVIS STREET
NORTH CHICAGO, ILLINOIS

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE

Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

Division of Motor Products Corporation, Detroit, Michiga

Grinding Vees and Flat Surfaces at Landis Tool Company

THOMPSON GRINDERS

● The battery of grinders shown includes two Thompson Surface and one Thompson Duplex Grinder for grinding Vees and flat surfaces simultaneously for Landis Tool Company.

Thompson Grinders are being used extensively in both machine tool and production shops due to their smooth flow of hydraulic power to head and table which produces exceptionally smooth surfaces.

The improved hydraulic application permits feeds and speeds which are impractical by any other means. A table feed of one hundred feet per minute permits the use of harder, more open, free cutting wheels and the production of smoother finishes at a great saving of time.

Control is an important factor — and the Thompson control of all power operated functions is within easy reach of the operator, in his normal working position, and is hydraulically balanced to move at the slightest touch. Thompson Grinders are powerful precision surface grinders designed to grind those extra large surfaces with the same degree of accuracy, speed and ease of operation obtained from smaller production machines.

Thompson offers a full range of types and sizes from the small tool room grinder 6" x 10" x 18" to the largest type "C" grinder 36" x 36" x 240". Bulletins upon request.

THE **Thompson** GRINDER CO.

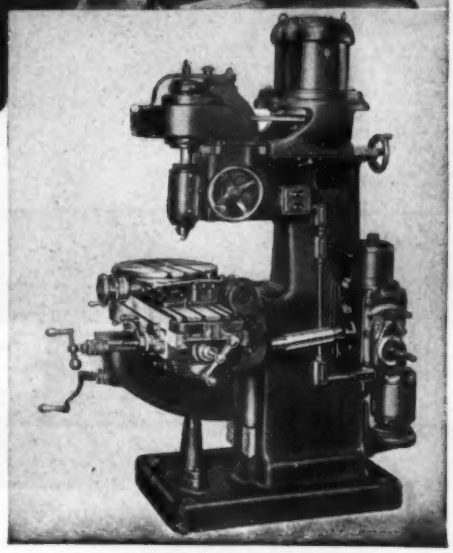
SPRINGFIELD, OHIO

ACCURACY COUNTS

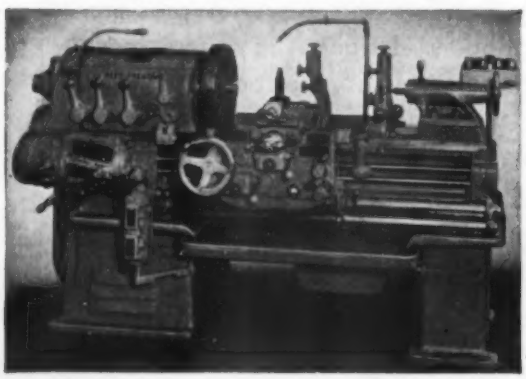
Rigid training of our soldiers is vital to their deadly accuracy and performance under fire. On that training, the result of experience, depends their chances for survival and victory.

The same is true of machine tools. Upon the skill and experience of designing engineers and the accuracy and ability of individual workmen, working as a unit, depend the successful operation of the machines they make.

Machine tools manufactured by Reed-Prentice will fight the present battle of production. What is more, the precision of their design and accuracy of their work guarantee their survival and fitness for the next war — the war of competitive markets where cost sheets will be weapons and quality the objective.



3VG VERTICAL MILLER
Long. feed 24". Cross feed 12"
Knee adjustment 18". 2850 lbs.



No. 5
VERTICAL MILLER
Longitudinal feed 48". Cross feed 16". Weight 11,500 lbs. Also supplied as Jig Borer.

14", 16" and 20"
ENGINE and
TOOLROOM LATHES

BRANCH OFFICES
1213 W. 3rd. St.
Cleveland. Ohio
75 West St.
New York City. N. Y.

REED-PRENTICE CORP.

MAIN OFFICE
WORCESTER
MASS. U. S. A.

The wheel easily slips into the Easymount and is as readily removed for quick replacement.

After placing the wheel in the Easymount, it is a matter of a moment to tighten the retaining screws, place the assembly on your grinder, and start production.

Try the Money-Saving Easymount and Wheel for Better Grinding!

Sterling's new Easymount and Wheel can be readily attached to your grinder as a permanent or easily-removed fixture. Inexpensive wheels can be tightened into the mount and quickly replaced as they wear down. A unique spring tension securely holds the wheel in place and provides quick, easy release.

The savings that are made possible by the Easymount and Wheel are obvious. Only the wheel needs to be replaced . . . the Easymount lasts the life of your grinder. Sterling's Easymounts and Wheels are available in sizes to fit various types of grinders—Sellers, Heald, Excello, Baldor, Hammond, Delta, Prosser, Criterion, Bura-Way, and Blount.

Wheels are furnished in sizes ranging from 5" to 14" in coarse, medium, and fine for roughing, semi-finishing, and finishing. They are made for grinding all types of steels and tungsten carbide metals, and they do it economically.

Ask for a trial test of the Easymount and Wheel. Foremen and workers like this new grinding idea and your cost sheet will readily prove its value. Write today at no obligation.

Send today for the new folder, just off the press, describing Sterling's new Easymount and Wheel. Full information is given to make your selection easy.

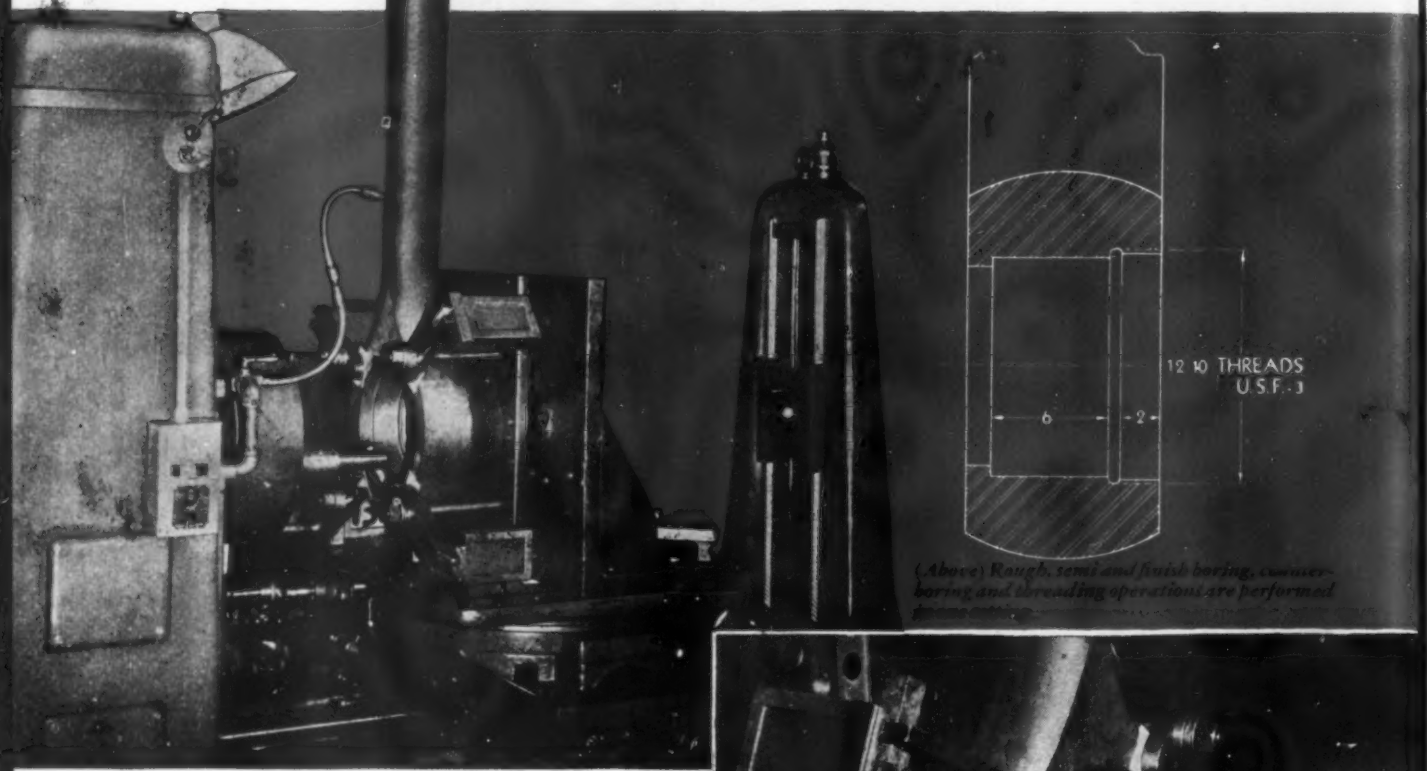
• STERLING ABRASIVES •

THE
STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

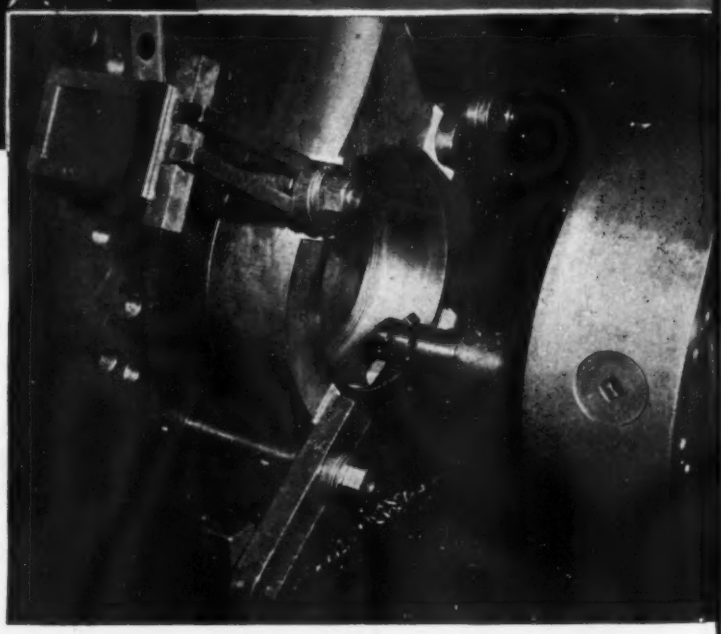
How to Bore and Thread UNUSUAL JOBS . . .

This G. & L. Horizontal Boring Mill with G. & L.



(Above) Rough, semi and finish boring, counterboring and threading operations are performed

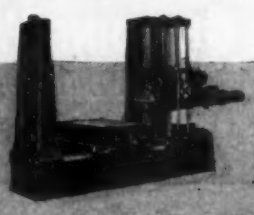
(Above) Showing method of mounting connecting rod on machine. Opposite end is supported by overhead hoist. Machine is G. & L. Table Type Machine.



(Right) Close up of threading operation being performed by G. & L. Continuous Feed Facing and Boring Head. See opposite page for additional data on this attachment.

GIDDINGS & LEWIS

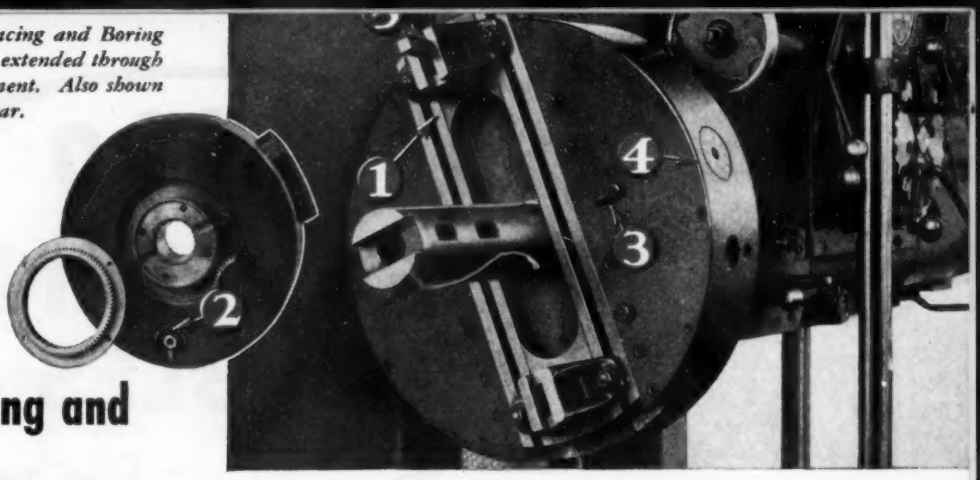
138 DOTY STREET



Right: G. & L. Table Type Machine.

Right: G. & L. Floor Type Machine.

(Right) The G. & L. Continuous Feed Facing and Boring Head with main spindle of the machine extended through the hardened steel bushing of the attachment. Also shown is the driving method and the flanged gear.



Continuous Feed Facing and Boring Head Does Both IN ONE SETTING!

This large connecting rod forging presents an unusual machining operation due to its size and the operations required. The operations consist of rough, semi and finish boring, counter-boring and threading a 12″ diameter bore. The thread is a V thread, approximately 2″ long, with 10 threads per inch U.S.F. Class-3 Fit. A Giddings & Lewis 17″ diameter continuous feed facing and boring head, mounted on the headstock of a G.&L. 25-RT Horizontal Boring, Drilling and Milling Machine, is used for the threading operation.

Reduce Settings and Save Time with this G. & L. Continuous Feed Facing and Boring Head

This attachment will help you do a lot of unusual jobs on your horizontal boring, drilling and milling machine. In addition to threading, it can be used for boring and facing *simultaneously.*

Mounting of the attachment requires only a few minutes of the operator's time. The five features described at the right make for easy, rapid adjustment and operation.

Because of its unusual design and construction, the continuous feed facing and boring head makes possible many operations and combinations of operations not ordinarily performed with the horizontal boring, drilling and milling machine.

A wide range of standard tools is available for use with this attachment. Special tools can be designed and built for specific applications.

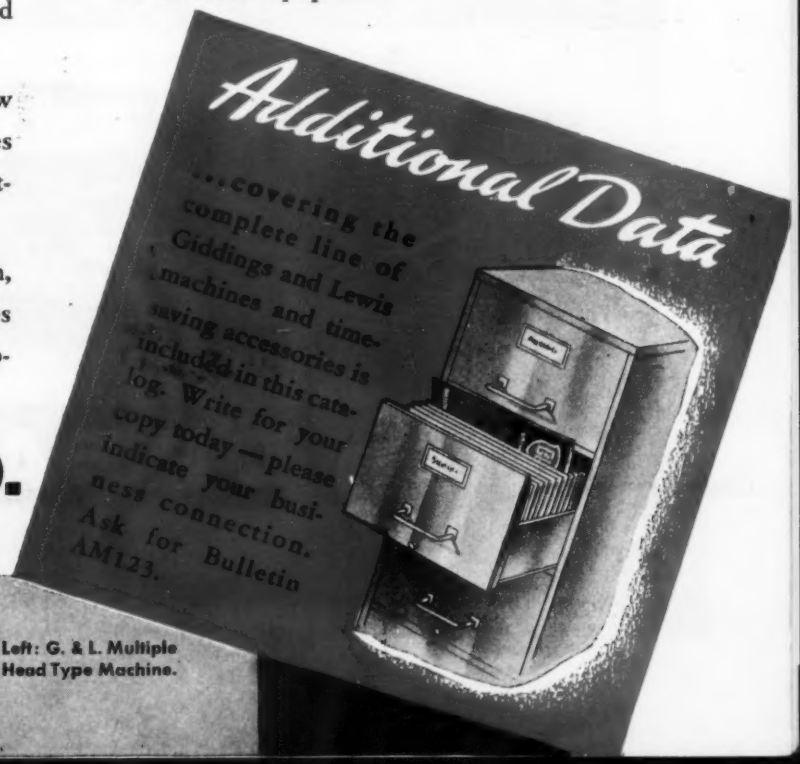
1 Tool Slide—Has six separate power feeds ranging from .009″ to .118″ per revolution of head.

2 Feed Selector—Control is provided for selection of any one of six feeds.

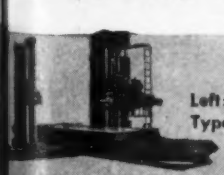
3 Directional Control—Lever points in direction of tool slide feed.

4 Micrometer Adjustment—Graduated to .001″ for tool slide adjustment.

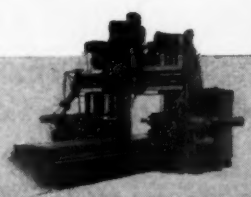
5 Two Tool Holders with ¾″ tool bits furnished as standard equipment.


Additional Data
...covering the complete line of Giddings and Lewis machines and time-saving accessories is included in this catalog. Write for your copy today — please indicate your business connection. Ask for Bulletin AM123.

MACHINE TOOL CO.
OND DU LAC, WIS.



Left: G. & L. Planer Type Machine.



Left: G. & L. Multiple Head Type Machine.

Ohio Revolving Tables are now being shipped with reasonable promptness.

OHIO REVOLVING TABLES

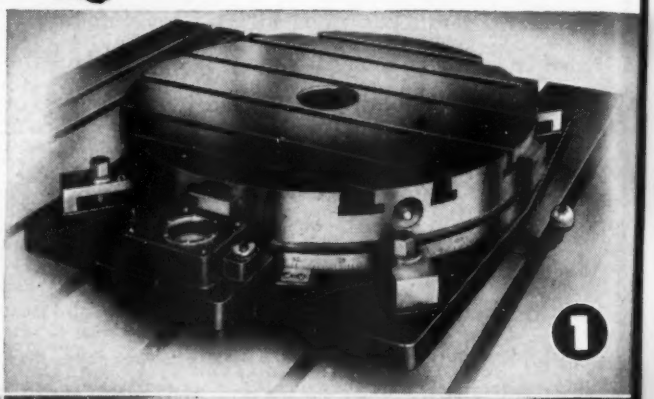
OHIO'S STEP UP PRODUCTION

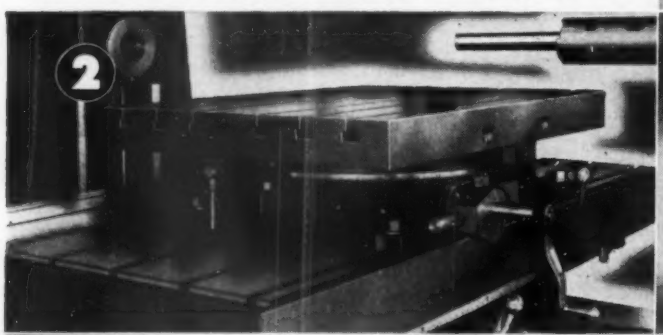
Ohio Revolving Tables are available in round and square types from 24" through 96", with many combinations. They are truly precision units accurately graduated in half degrees. They can be supplied with indexing pins with any number of indexing positions or precision dial indexing units. They can be arranged for use with horizontal or vertical boring, drilling and milling machines and many other types illustrated.

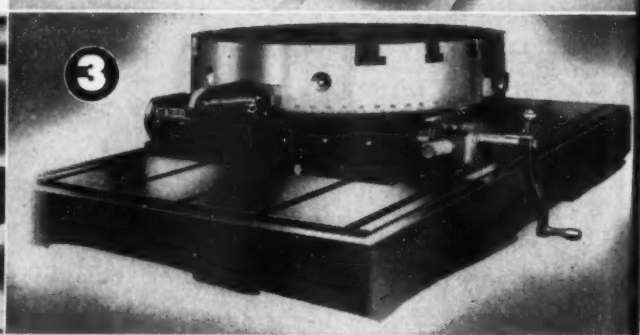
(1) 30" diameter revolving table on base plate with precision dial and anti-friction raising device; 24", 36", and 48" similar. (2) 36"x 48" square worm feed revolving table with index pin and bracket, 4 index pin positions, worm throw-out, and anti-friction raising device. (3) 36" diameter worm feed revolving table with index pin and bracket, 4 index pin positions, worm throw-out, and anti-friction raising device. (4) 72" diameter worm feed revolving table with precision dial, worm throw-out anti-friction raising device, and power feed.

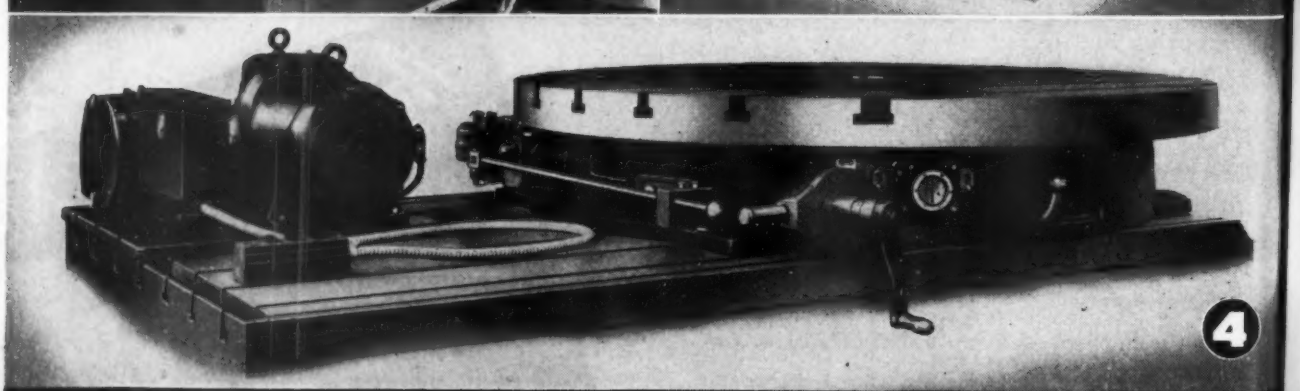
We'll be glad to send you Bulletin 375.

THE OHIO MACHINE TOOL CO., KENTON, OHIO



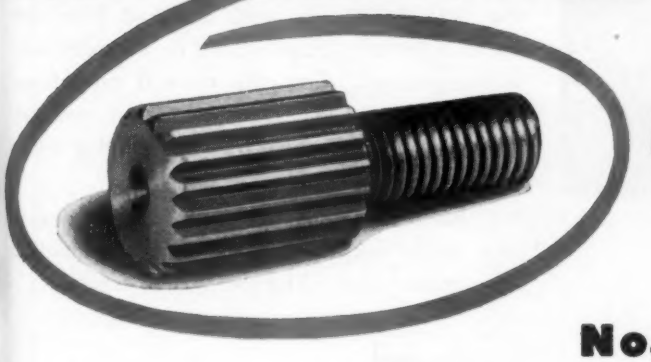






OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS



ANOTHER EXAMPLE OF

BARBER-COLMAN

HOBBING PERFORMANCE

No. 3 HOBBING MACHINE

HOBS SERRATIONS TO .002" ON P.D. *with Unground* HOBS

The method of holding and the high degree of accuracy obtained with *unground* hobs, are the most interesting features of this job. The part is a clamp screw for a machine tool and is made of X1315 steel. The serrated, or splined, portion is 1⅛" long and ⅞" diameter. Nineteen special form serrations are cut, using a Barber-Colman straight bore, UNGROUND hob. A standard Barber-Colman No. 3 Hobbing Machine is used, with a feed of .040" per revolution of the work and a hob speed of 230 r.p.m., which gives a floor-to-floor time of approximately 4½ minutes per piece. To hold the piece, the threaded portion is simply screwed into a shaft where it is held by a clamp nut, the outer end being supported by a regular center. Accuracy standards call for limits of +.000"/−.002" on pitch diameter. This accuracy is consistently maintained. *For dependable performance on all kinds of work, use BARBER-COLMAN Hobbing Machines.*

•

Buy War Bonds

BARBER B-C COLMAN PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

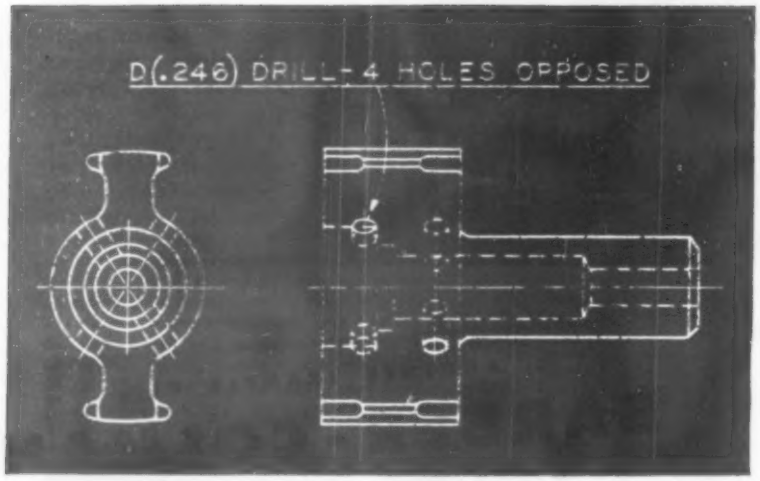
Barber-Colman Company

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

There are 2 *ways to do this job —*

1. The EXPENSIVE WAY . . . or

2. The FLEXIMATIC *by KINGSBURY*

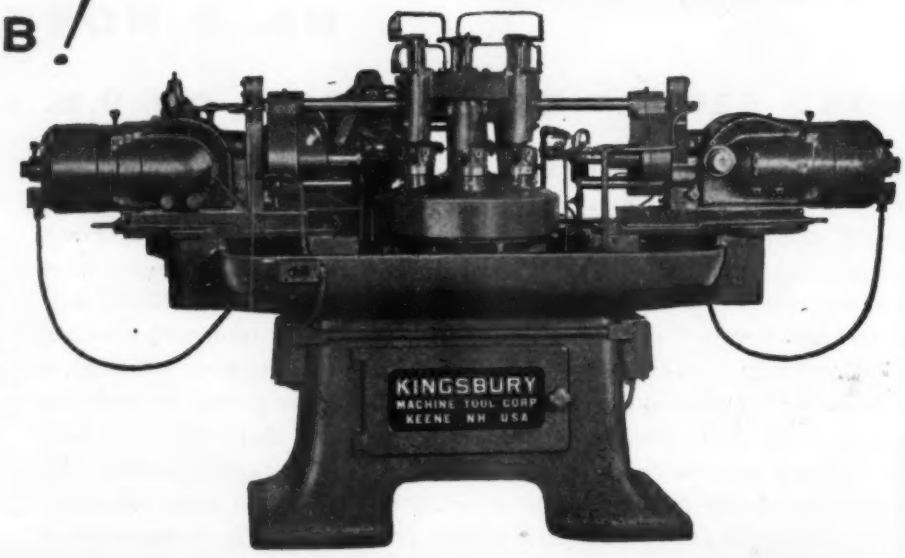


WAY

The expensive way to drill the four opposed holes in this stock absorber part would be to use a general-purpose drilling machine. Production would be limited to one hole at a time and by operator skill in manual indexing, etc. The FLEXIMATIC way uses standard Units set up on a standard base around an automatically indexing turret. The only manual operations are loading and unloading, and even as these are being performed the Units are drilling work already loaded.

FLEXIMATICS combine the speed and efficiency of a special purpose machine with the valuable advantages obtained by the flexible set-up.

Standard Kingsbury Units for drilling, reaming, boring, spot facing and many milling operations may be mounted in any combination on standard bases and readily changed over to manufacture a wide variety of parts.



KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A

It is reported that . . . . . .

Instant-starting fluorescent lamps in a greater variety of shapes and sizes are promised after the war.

get ready with CONE for tomorrow

A laboratory model of an electron microscope has been made that fits into two suitcases and weighs 133 pounds.

get ready with CONE for tomorrow

One large processor of cereals intends to go into the manufacture of electrical appliances for use as premiums.

get ready with CONE for tomorrow

An aircraft manufacturing company has announced its intention of manufacturing washing machines and refrigerators after the war.

get ready with CONE for tomorrow

Natural gas is being frozen and stored for emergency use in one American city. It is believed possible to ship gas in this form from the oil fields to Eastern markets.

get ready with CONE for tomorrow

The American Petroleum Institute reports that proved reserve sources of crude oil are sufficient to meet requirements for "many generations".

get ready with CONE for tomorrow

A waterproof match has been developed for jungle use and should be a convenience to hunters, campers, and fishermen after the war.

get ready with CONE for tomorrow

The Navy is using concrete storage tanks for gasoline. Seepage is prevented by painting the inside with sodium silicate.

get ready with CONE for tomorrow

A new chromium plating salt is claimed to be more economical and non-poisonous.

One large manufacturer of automotive engines will have a lightweight, air-cooled, four-cylinder opposed engine, based on its aircraft engines, for low-priced, post-war automobiles.

get ready with CONE for tomorrow

A special new remover makes it possible to strip the paint from blacked-out windows with a hose and cold water.

get ready with CONE for tomorrow

A device, now being added to large radial aircraft engines, injects water into the combustion chamber for better cooling, less detonation, and greater fuel economy.

get ready with CONE for tomorrow

A new tool prevents wrinkles in pressed sheet metal.

The new 4.9 mile Chicago subway is the first section of a system of four units planned to include 55 miles of line and to cost 275 million dollars.

get ready with CONE for tomorrow

The Alien Property Custodian has granted licenses to use more than 2,500 of the 45,000 enemy patents that he is holding.

get ready with CONE for tomorrow

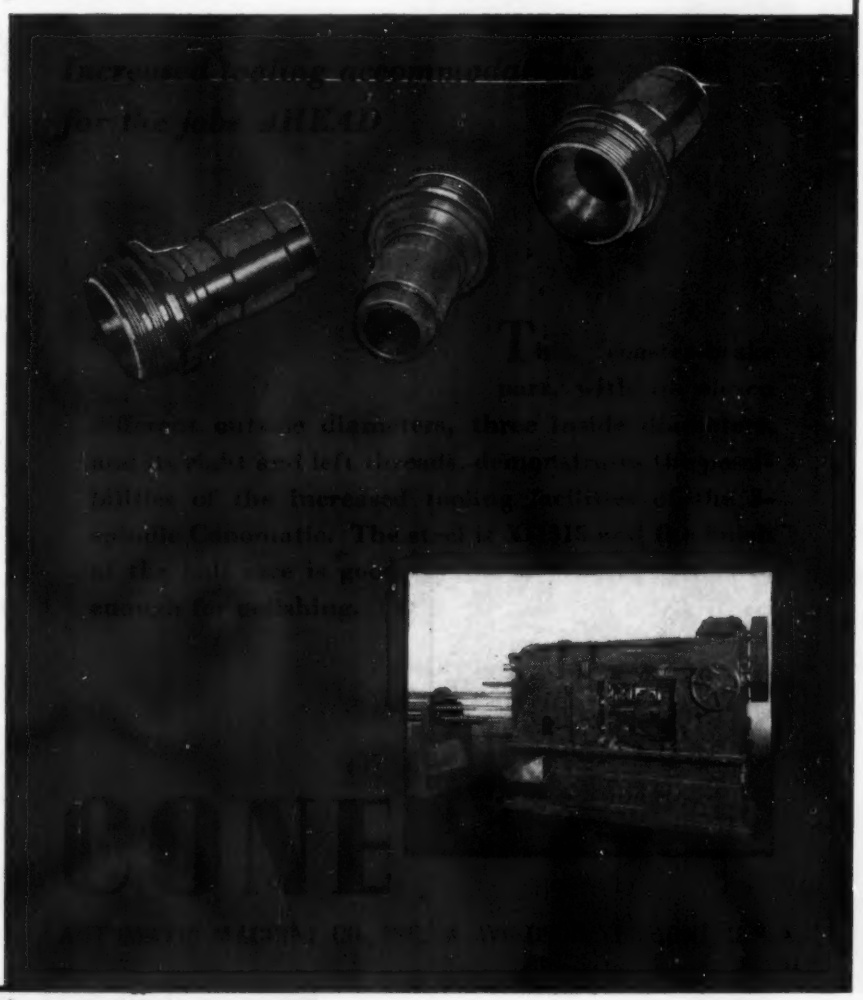
Ultra sound waves are being used to break the oxide layer from the surface of sheet aluminum before plating with tin.

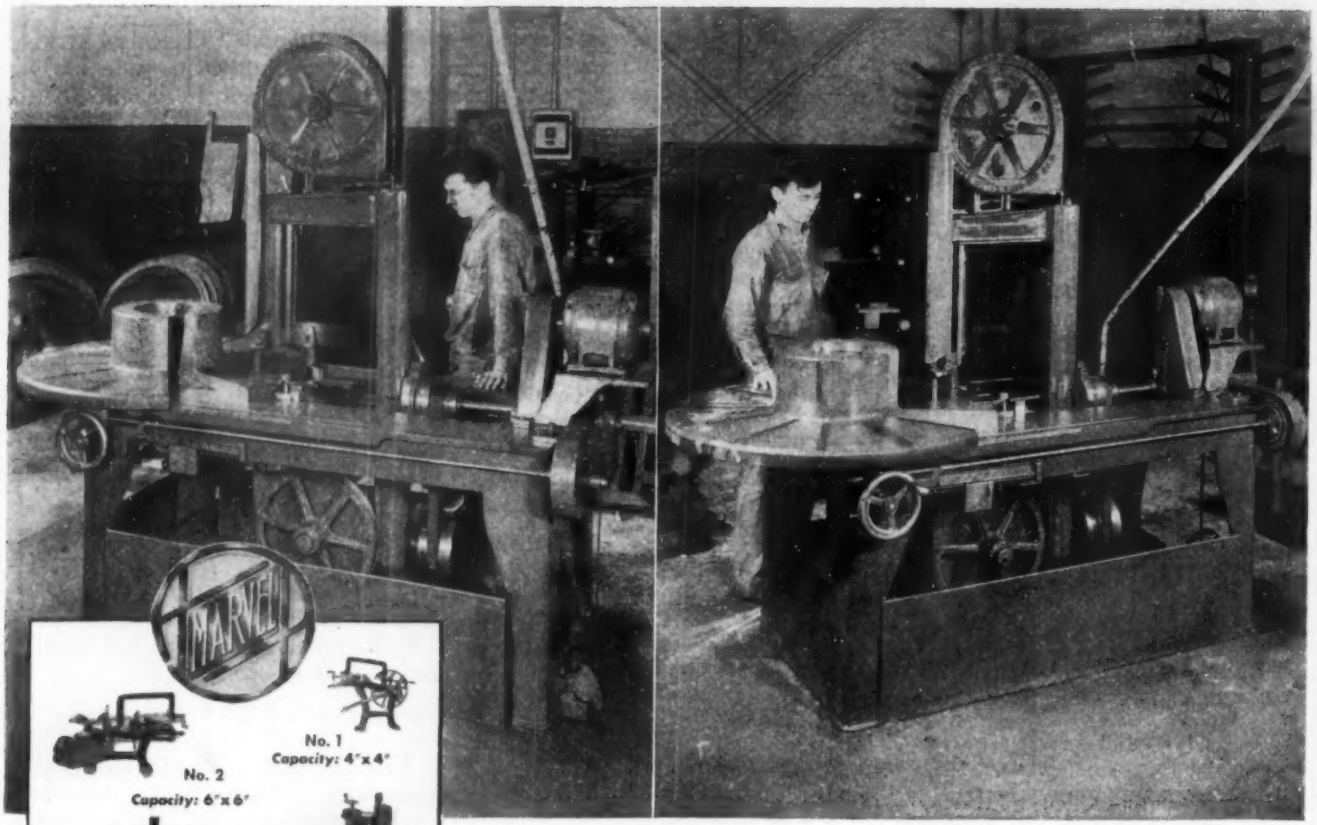
get ready with CONE for tomorrow

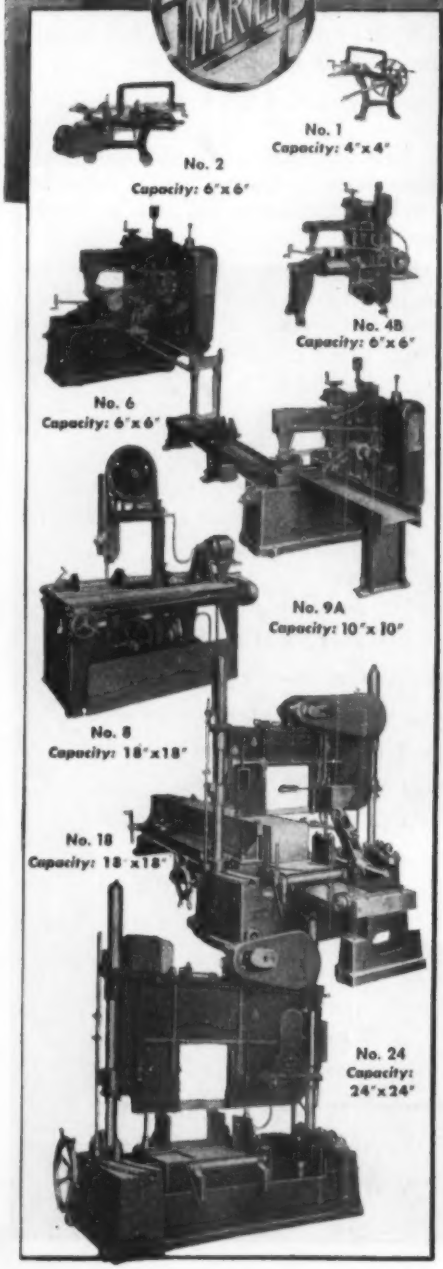
A new electric motor weighing 7 pounds develops 3 horsepower at 120,000 r.p.m. and reaches full speed in less than a second.

get ready with CONE for tomorrow

One application of a new chemical insecticide to the walls of a room is said to continue to kill flies for three months.







The No. 8 MARVEL Band Saw does the "Impossible"

This "impossible" job required the cutting into 12 equal sections of a cast steel ring 42" in diameter. The ring was to be an expanding chuck for stretching and sizing automobile tire rims. Each ring weighed 750 pounds, the length of the cut was 15" and the thickness of the material at the hub was over a foot in thickness. The sectioning of this ring with ordinary equipment was "impossible" because of the high cost involved and the special handling fixtures needed.

The Chicago Gear Mfg. Company, with several MARVEL Saws, including a No. 8 Band Saw, could take this job because they knew that with the Universal MARVEL No. 8 and its broad planer-type bed no special setting-up fixtures or tools would be necessary and that their regular saw operator could service the machine without interfering with his regular work.

The MARVEL No. 8 handles all work up to 18" x 18" cross section and does cutting-off mitering and notching. The blade feeds into the work at any angle from 45° right to 45° left. It is the most versatile metal-cutting saw built.

ARMSTRONG-BLUM MFG. CO.

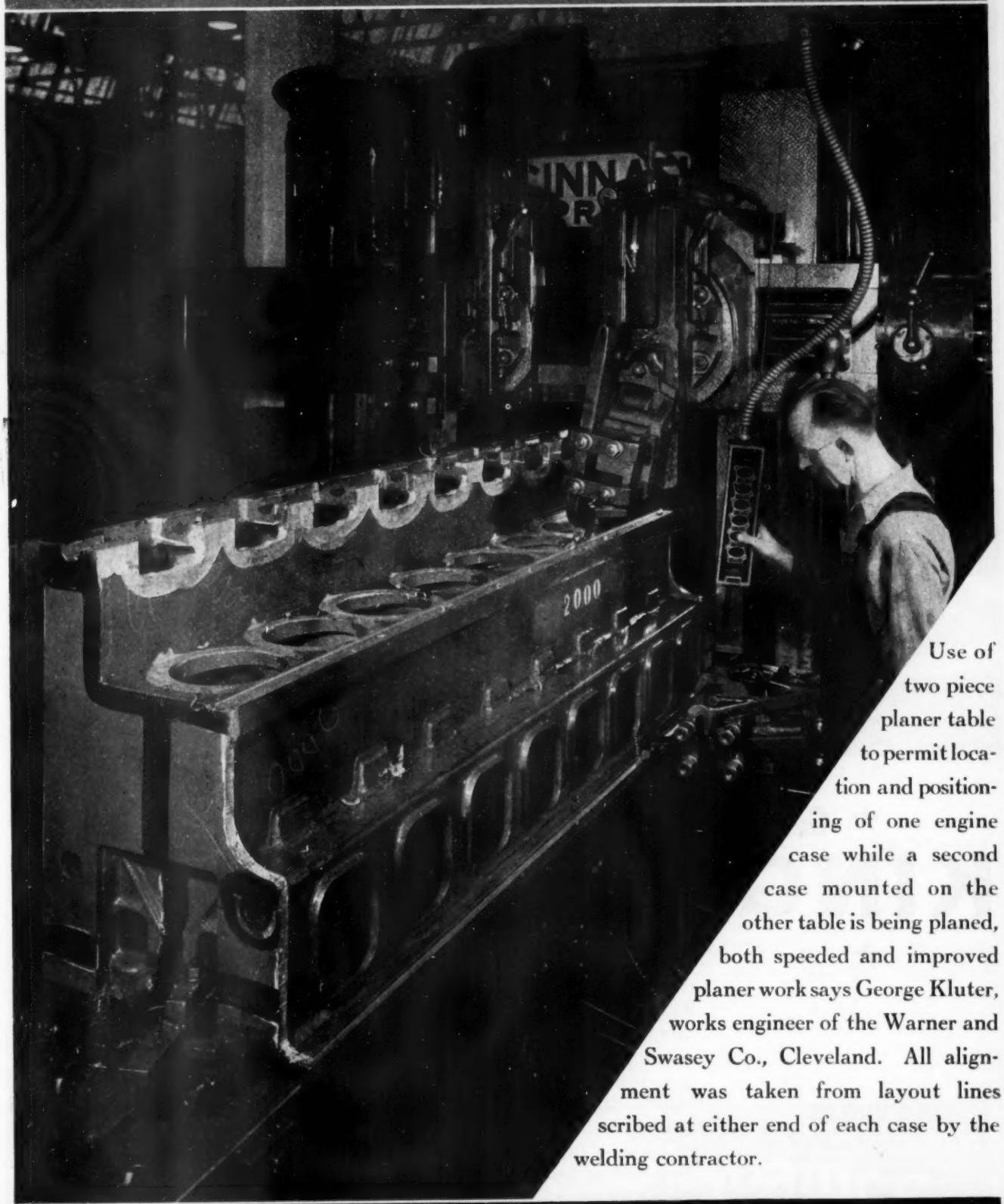
"The Hack Saw People"

5700 W. BLOOMINGDALE AVE. **CHICAGO 39, U.S.A.**

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS

HYPRO-DUCTION PLANING



Use of two piece planer table to permit location and positioning of one engine case while a second case mounted on the other table is being planed, both speeded and improved planer work says George Kluter, works engineer of the Warner and Swasey Co., Cleveland. All alignment was taken from layout lines scribed at either end of each case by the welding contractor.

THE CINCINNATI PLANER COMPANY

Planers . Vertical Boring Mills . . . Planer Type Millers

CINCINNATI . OHIO . U.S.A.

★ Getting down to close tolerances on a KING Vertical Boring and Turning Machine . . . ★

● Here the operator is adjusting the tool for a finish boring cut on a low pressure blade ring for a C-1 turbine. A facing operation is also completed on the same set up.

Rigidity to meet precision demands is one of the features of King design and construction.

Ample power to make heavy cuts in tough steel castings and forgings is also an important point in King design and construction.

And the high table speeds available assure maximum production on all boring—turning—facing and similar operations.

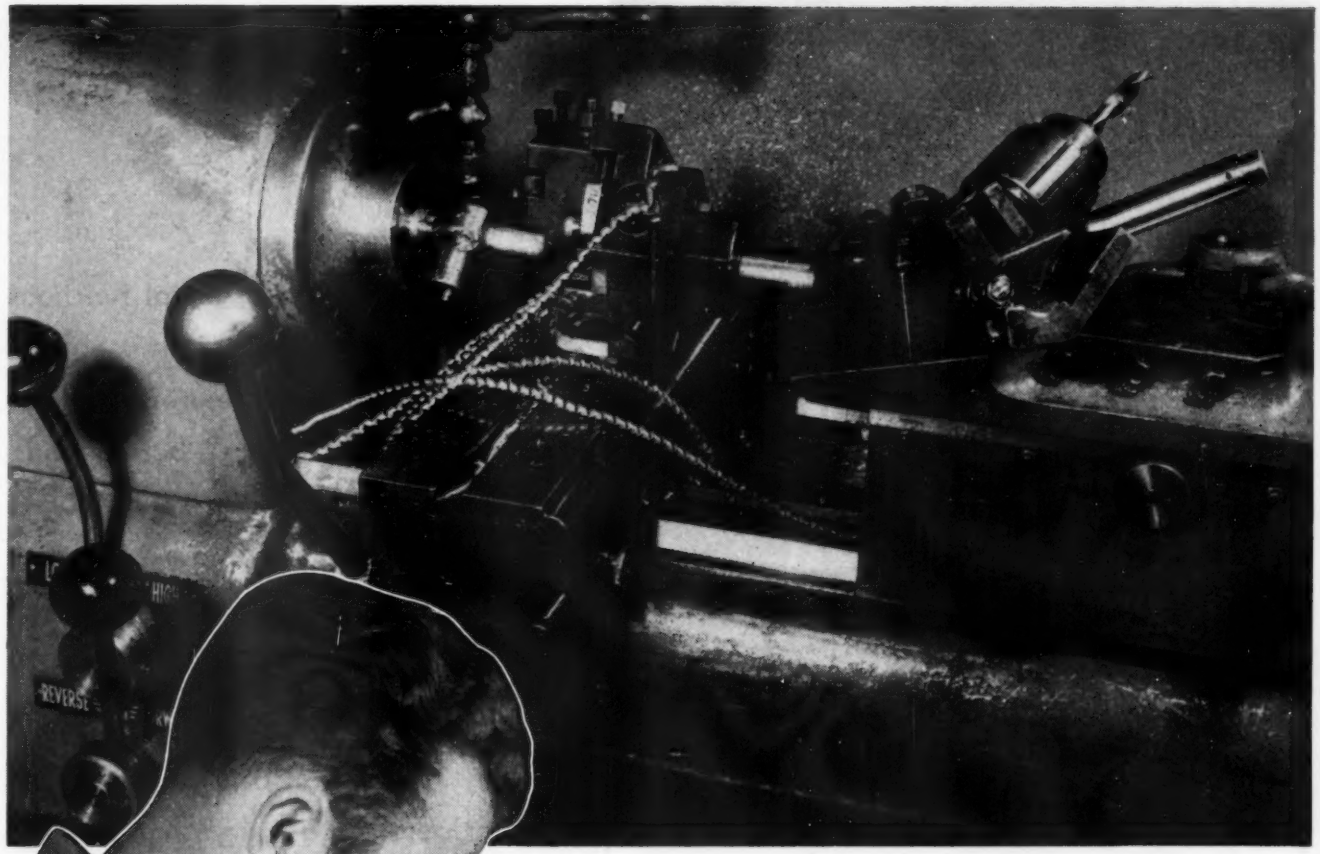
If your work calls for close tolerances you can get them closer, in less time, on a King Vertical Boring and Turning Machine.

KING BUILDS

Vertical Boring and Turning Machines exclusively in single column types from 30" to 42"—double column types up to 12 feet.

THE KING MACHINE TOOL COMPANY
CINCINNATI 32, OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY



HARDINGE *means precision performance to the Aviation Industry*

Top photograph: HARDINGE Second Operation Machine set up to drill, turn and undercut a 24 S.T. aluminum alloy casting held in a double shank fixture at North American Aviation, Inc.

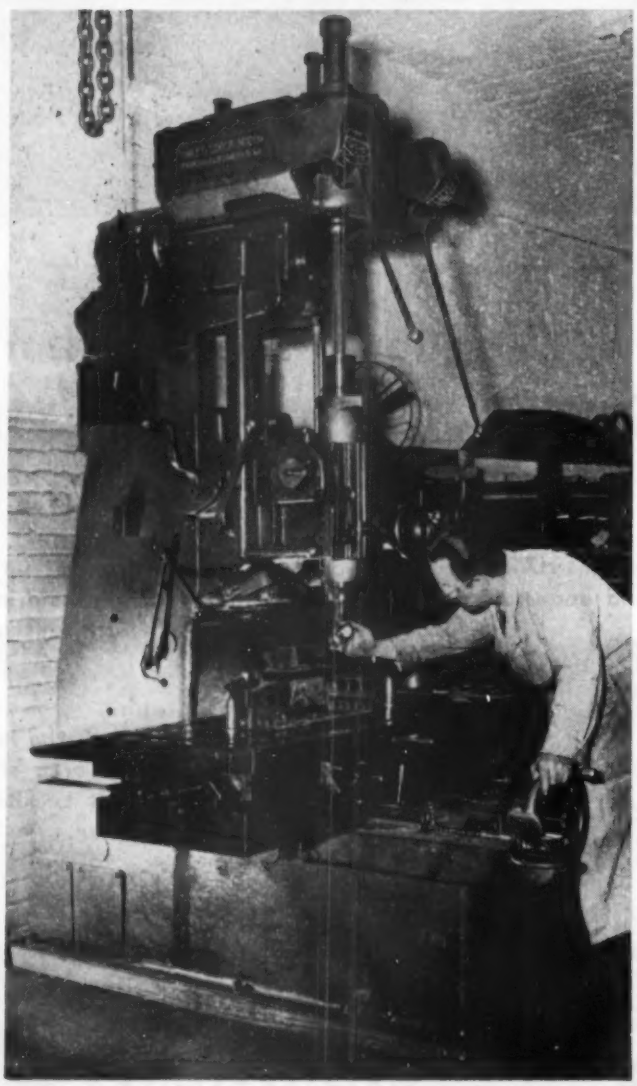
Write for 16-page bulletin illustrating and describing all Hardinge precision products.

Bottom photograph: HARDINGE Tool Room Lathe turning a nose gear drag strut from 1" to 5/8" at Lockheed Aircraft Corporation.

HARDINGE
ELMIRA, N.Y.

Where accuracy is a first objective

FOSDICK
JIG BORER



ARMY E NAVY

● One of the most essential functions in tool-die and fixture work is obtaining and maintaining extremely close tolerances. On drilling—boring—and reaming operations Fosdick Jig Borers are doing a real job on precision work in tool rooms and tool and die shops all over the country.

Designed for ease of operation—built rigidly to meet all accuracy demands—provided with a wide range of feeds and speeds—Fosdick Jig Borers offer exceptional versatility of operation.

Moderately priced this machine not only meets the close tolerances demanded on war time production but does it more economically.

If your work calls for precision boring, drilling, reaming or similar operations—put it on a Fosdick Jig Borer.

Full design and construction details and several typical job installations are contained in the Fosdick Jig Borer bulletin.

Write for your copy today.

★

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

ACCURACY AND QUALITY

Federal BALL BEARINGS

Automotive • Industrial • Aircraft • Marine • Military

THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

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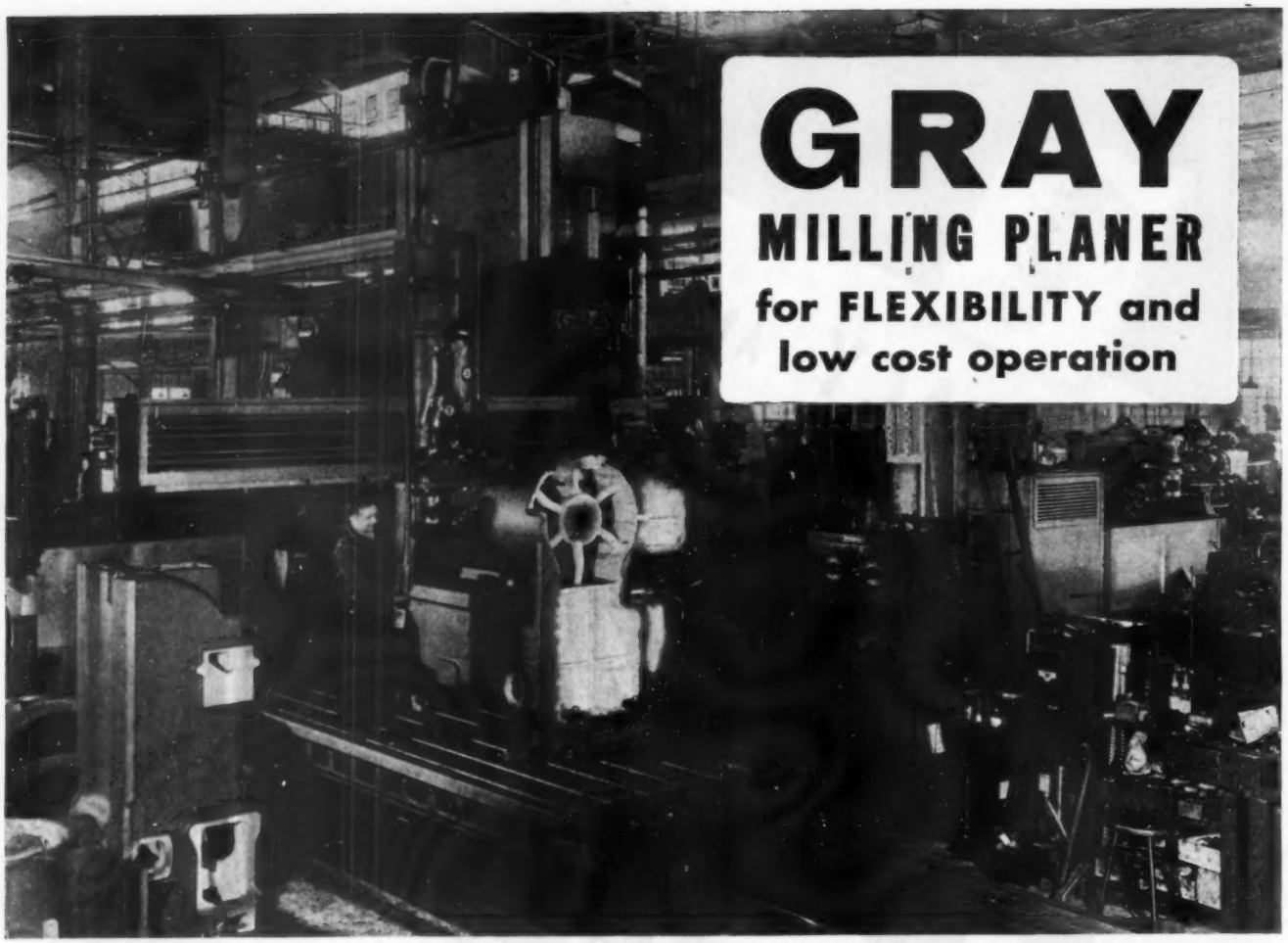


● On this particular job a milling operation is being performed on the base of a Bullard "Cut Master" Vertical Turret Lathe.

The Gray Openside Milling Planer doing the job can be used equally well for planing — drilling and boring operations. It has been found a particularly versatile machine for handling numerous operations on a wide range of work. Several operations may be performed from one set-up.

Thus the real economy of the machine is its adaptability to a wide range of work with an investment in only one machine.

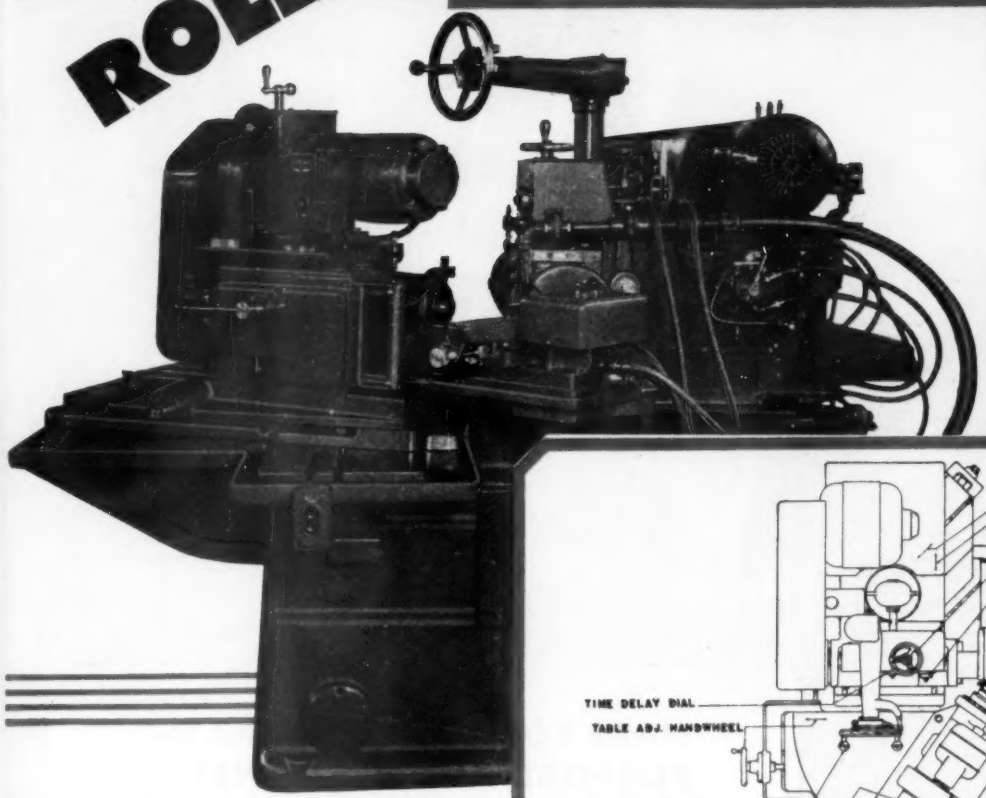
In addition to being extremely rigid and producing a wide variety of precision jobs the Gray Milling Planer offers unusual economies in operation.

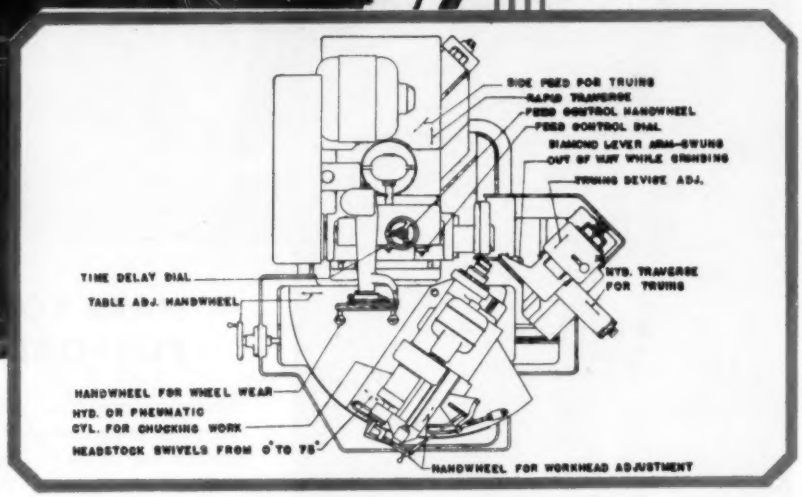
Consult Gray on your planing — drilling — boring — and milling operations or ask for the Gray Milling Planer bulletin for full details on construction — range of work — economy of operation.

THE G. A. GRAY COMPANY
Cincinnati 7 Ohio, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

GRIND ROLLER BEARING RACES ON A FITCHBURG





...and other Chucking Grinding Operations

THE latest Fitchburg Roller Bearing Race Grinder employs a single standard Fitchburg Bowgage Grinding Wheelhead Unit. The workhead is adjustable from 0 degrees to 75 degrees so that the machine can be used for many other straight or taper grinding jobs.

The Fitchburg Roller Bearing Race Grinder is completely automatic. By pressing a single button the wheelhead goes through its standard automatic cycle — rapid traverse to the work, proper grinding feed, spark-out time, and rapid return. Work is held to limits of .0002" in production.

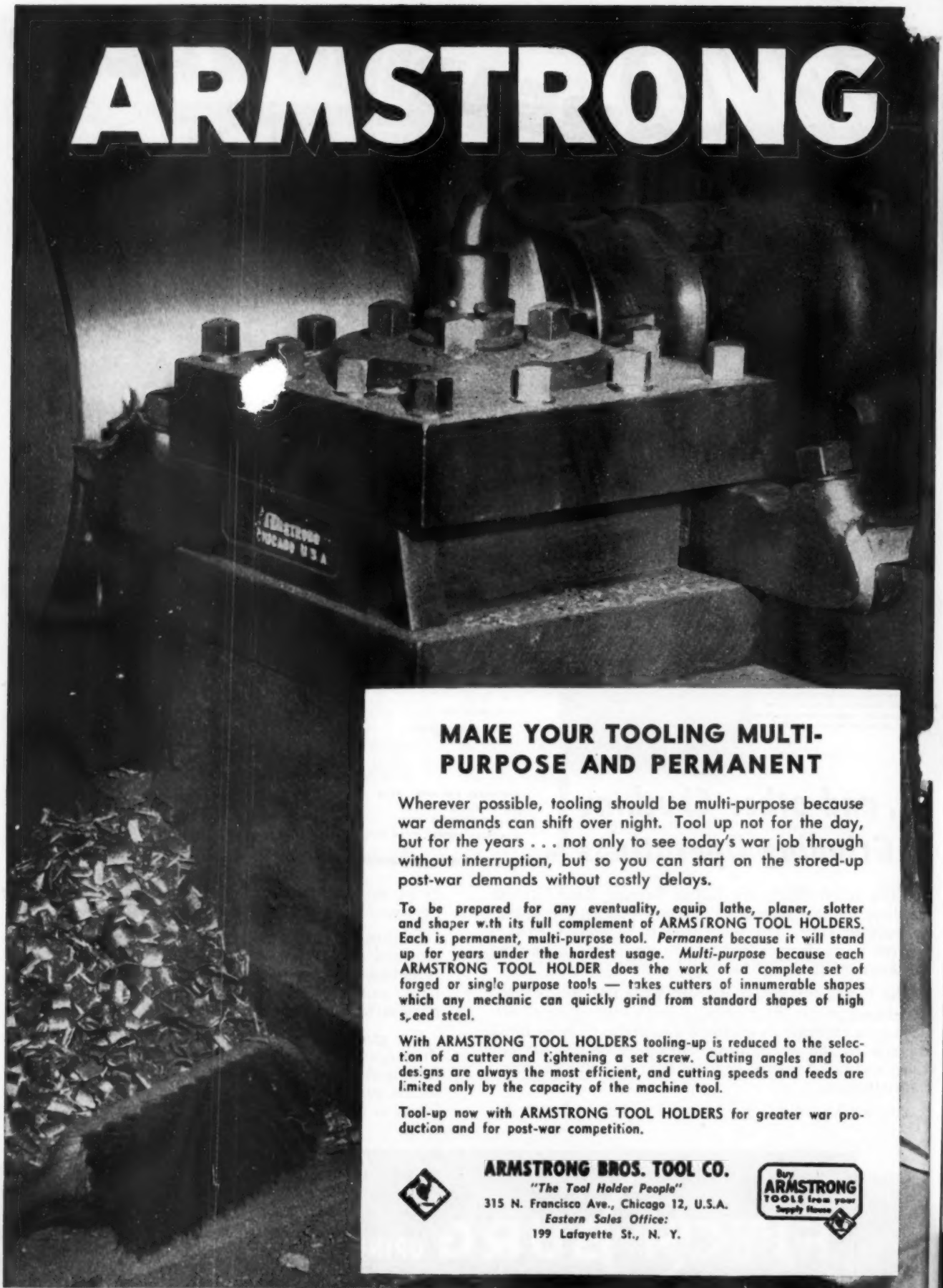
The workhead can be arranged either hydraulically or pneumatically for collet clamping or other chucking devices.

In this taper grinding application, the wheelhead is mounted on a 45° slide for trueing. The trueing device is mounted on the side of the base parallel to the wheelhead, and is hydraulically operated for trueing, with micrometer adjustment for positioning.

For grinding roller bearing races a Fitchburg grinds them faster and more accurately than other methods. A leading American manufacturer reports enthusiastically on the quality and low production cost of this machine. Write us today for complete information.

FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U.S.A.
Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

ARMSTRONG



MAKE YOUR TOOLING MULTI-PURPOSE AND PERMANENT

Wherever possible, tooling should be multi-purpose because war demands can shift over night. Tool up not for the day, but for the years . . . not only to see today's war job through without interruption, but so you can start on the stored-up post-war demands without costly delays.

To be prepared for any eventuality, equip lathe, planer, slotter and shaper with its full complement of ARMSTRONG TOOL HOLDERS. Each is permanent, multi-purpose tool. *Permanent* because it will stand up for years under the hardest usage. *Multi-purpose* because each ARMSTRONG TOOL HOLDER does the work of a complete set of forged or single purpose tools — takes cutters of innumerable shapes which any mechanic can quickly grind from standard shapes of high speed steel.

With ARMSTRONG TOOL HOLDERS tooling-up is reduced to the selection of a cutter and tightening a set screw. Cutting angles and tool designs are always the most efficient, and cutting speeds and feeds are limited only by the capacity of the machine tool.

Tool-up now with ARMSTRONG TOOL HOLDERS for greater war production and for post-war competition.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. Francisco Ave., Chicago 12, U.S.A.
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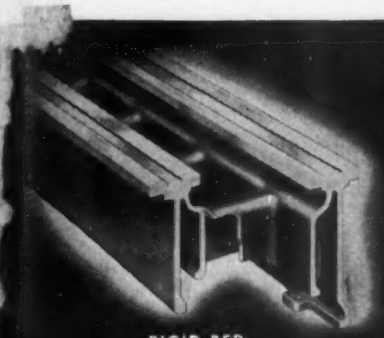
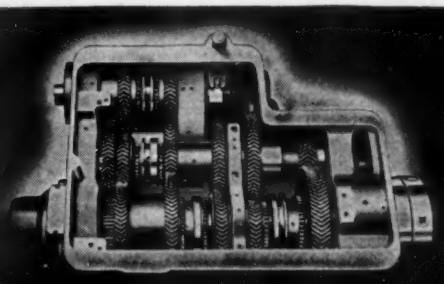
Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms



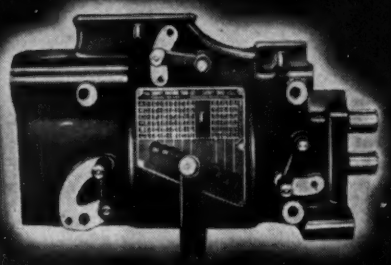
RIGID BED CONSTRUCTION



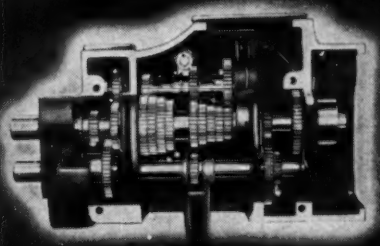
CONTINUOUS TOOTH 30° HELIX HERRINGBONE GEARED HEAD

Sidney

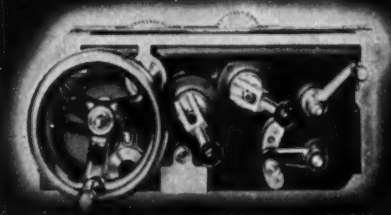
40TH ANNIVERSARY



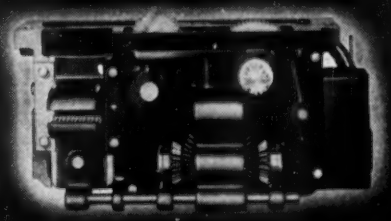
FRONT VIEW OF GEAR BOX



REAR VIEW OF GEAR BOX

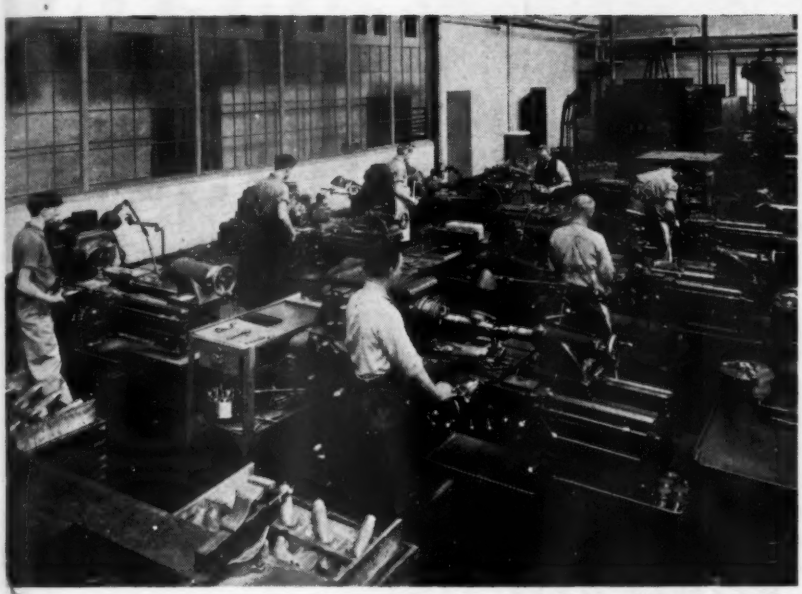


FRONT VIEW OF DOUBLE WALL APRON



REAR VIEW OF DOUBLE WALL APRON

SIDNEY COMPOUND REST



Courtesy of Spencer Lens Co.

A battery of SIDNEY LATHES *on* PRECISION PRODUCTION

The fine tolerances required in machining parts for optical instruments is being accomplished on this battery of Sidney Lathes.

The inherent rigidity—the continuous tooth Herringbone Geared Head—the wide range adaptability of Sidney Lathes provides both the accuracy and flexibility of production necessary at this plant.

You can depend on Sidney Lathes for greater production—closer tolerances—and exceptionally fine finish.

Full descriptive bulletins on all sizes available

SIDNEY

The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO

BRYANT THREAD GAGES

AN *ENTIRELY NEW*

PRINCIPLE OF COMPLETE THREAD INSPECTION THREE TO FOUR TIMES FASTER THAN RING AND PLUG GAGING—ELIMINATING HUMAN ELEMENT IN SETTING GAGE WITH MASTER PLUG AND DURING INSPECTION OF WORK PART.

- ★ One unskilled operator replaces four or five skilled inspectors.
- ★ Gives complete over-all inspection in a few seconds.
- ★ Thread segments have many times the life of ring and plug gages.
- ★ Master gage accuracy transferred quickly to production parts.
- ★ Available in three standard models. (Special sizes on request.)

The NEW BRYANT THREAD GAGE checks the entire circumference of internal and external threads in a few seconds. The operator merely drops the part on the work rest, releases the control lever, and gives the work a *partial* turn only. The dial reading shows the accumulated inaccuracies in lead, taper, pitch diameter, thread form, and the presence of burrs or surface inaccuracies.

The Bryant Thread Gage makes it possible—*as never before*—to transfer the measurements of master thread gages accurately and quickly to the parts being produced—it eliminates tedious, slow, and expensive methods requiring skilled inspectors.

Write today for illustrated folder No. G2 which gives complete details.

BRYANT CHUCKING GRINDER COMPANY
SPRINGFIELD, VERMONT, U. S. A.

LOOK AHEAD...LOOK FAR AHEAD

When you are released from war contracts, engineering service is the first thing you'll need —more of it no doubt than your own organization can supply with the speed that will be imperative. Now, or at the moment the shape of your peacetime products takes form, Vulcan's engineering staff can tackle the draughting of a production set-up that will streamline the reconverted plant for utmost speed, economy and volume. By the time you are released from war production we shall be also, and can follow through with actual manufacture of the new special tools.

Let's get acquainted now. One way to begin is to write for the brochure pictured here.

Ask for the brochure illustrated. It will acquaint you with Vulcan's experience, facilities and services.

The VULCAN TOOL Company

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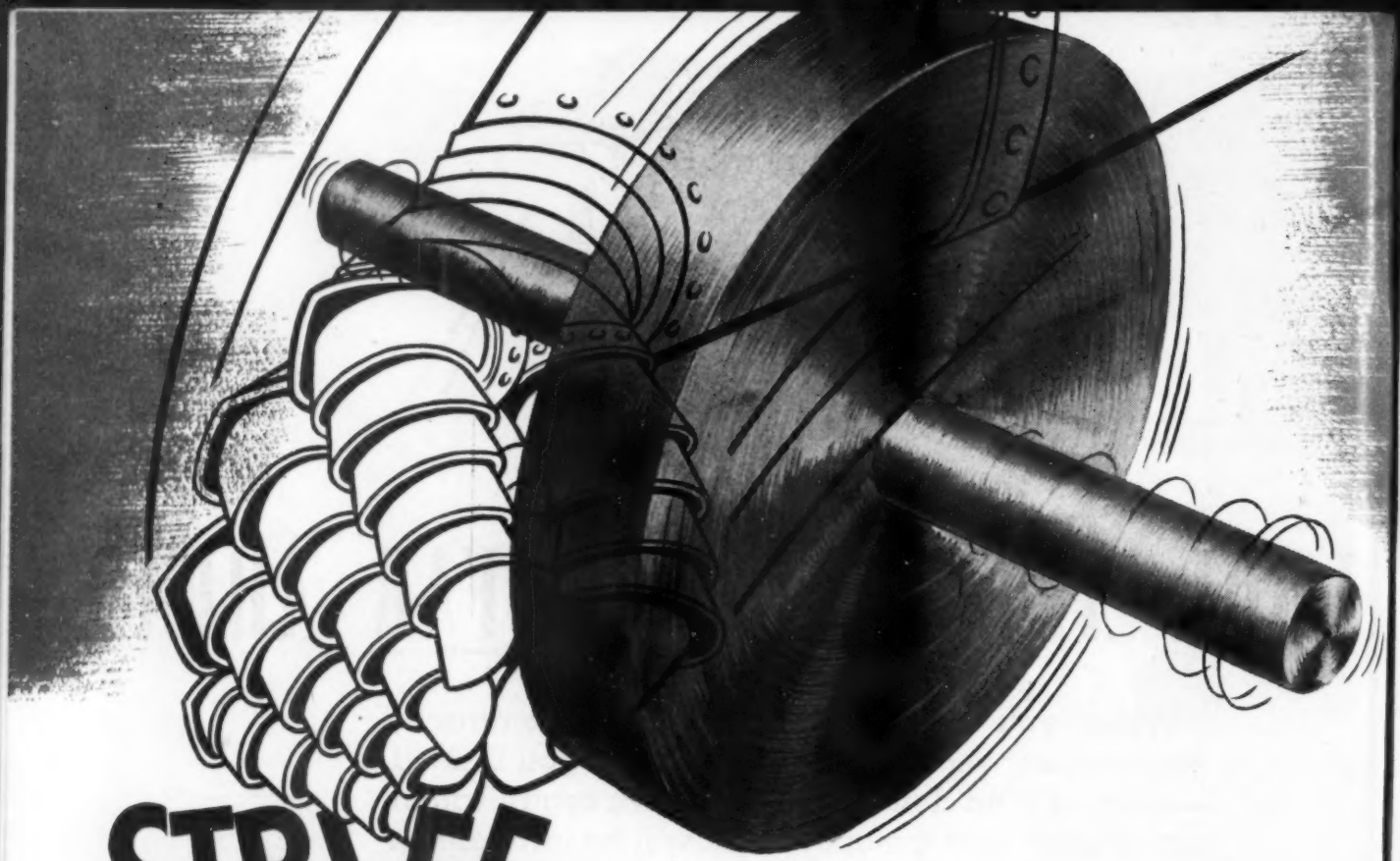


STRIFE begins at 40 (r.p.m.)

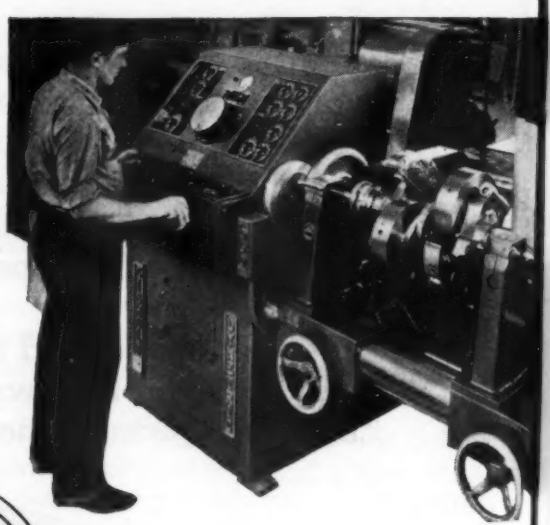
YES, strife—*destructive vibration*—can enter a rotating assembly even at 40 r.p.m., depending on the size and weight of the body.

But 40 r.p.m. is nothing, by today's standards. For modern machinery demands speed, speed and more speed . . . not just 40, nor even 40 hundred, but speeds as high as 40 *thousand* r.p.m.!

Without accurate static and dynamic balance, such speeds could never be maintained.

The pounding, tearing, wearing effect of unbalanced forces on bearings and delicate machine structures must be eliminated. That is the job of GISHOLT DYNETRIC BALANCING MACHINES*. With the aid of lightning-fast electrons, they have made balancing a low-cost production process, ready to be applied to all kinds of rotating parts.

If smooth, vibrationless operation can improve the performance of your product, ask for information about Dynetric Balancing.



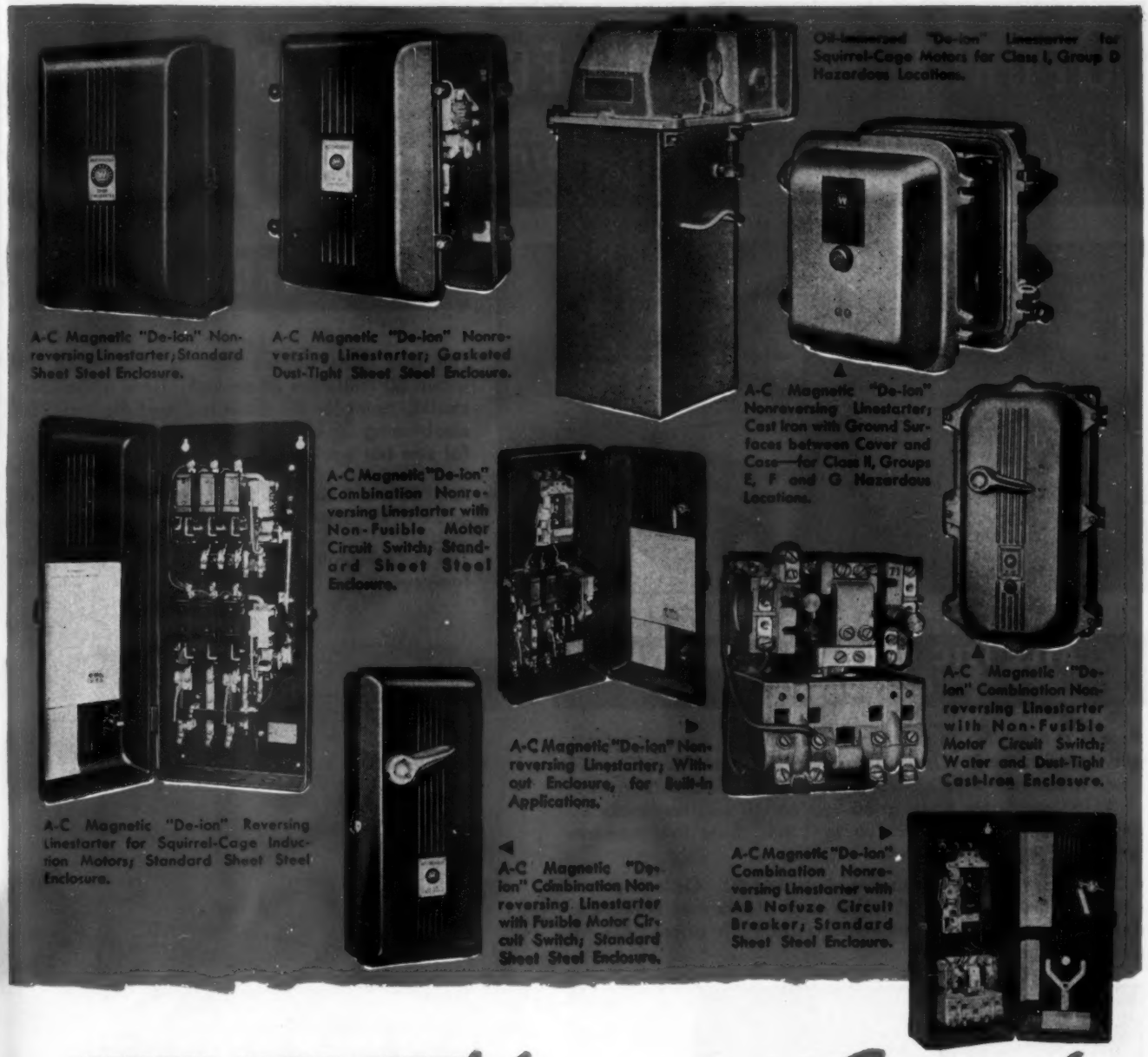
**A development of Westinghouse Research Laboratories.*

GISHOLT MACHINE COMPANY
1201 E. Washington Ave., Madison 3, Wisconsin

DYNETRIC BALANCING MACHINES
widely used to insure the smooth, accurate perf
ance of radial and in-line crankshafts, armat
aircraft propellers, etc. It is the fastest, most acc
means ever developed.

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements

TURRET LATHES • AUTOMATIC LATHES
BALANCING MACHINES
SPECIAL MACHINES


A-C Magnetic "De-ion" Nonreversing Linestarter; Standard Sheet Steel Enclosure.
A-C Magnetic "De-ion" Nonreversing Linestarter; Gasketed Dust-Tight Sheet Steel Enclosure.
Oil-Immersed "De-ion" Linestarter for Squirrel-Cage Motors for Class I, Group D Hazardous Locations.
A-C Magnetic "De-ion" Nonreversing Linestarter; Cast Iron with Ground Surfaces between Cover and Case—for Class II, Groups E, F and G Hazardous Locations.
A-C Magnetic "De-ion" Combination Nonreversing Linestarter with Non-Fusible Motor Circuit Switch; Standard Sheet Steel Enclosure.
A-C Magnetic "De-ion" Reversing Linestarter for Squirrel-Cage Induction Motors; Standard Sheet Steel Enclosure.
A-C Magnetic "De-ion" Nonreversing Linestarter; Without Enclosure, for Built-in Applications.
A-C Magnetic "De-ion" Combination Nonreversing Linestarter with Fusible Motor Circuit Switch; Standard Sheet Steel Enclosure.
A-C Magnetic "De-ion" Combination Nonreversing Linestarter with Non-Fusible Motor Circuit Switch; Water and Dust-Tight Cast-Iron Enclosure.
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WHEN YOU NEED *Magnetic Controls*

FOR SINGLE-PHASE AND SQUIRREL-CAGE MOTORS CONSULT WESTINGHOUSE BUYING DATA (NEW CATALOG 7000)

With the new Westinghouse Buying Data, you can select and purchase the proper motor control in half the time.

Data, as presented, is striking in its newness. It's easier to read, easier to understand, and easier to use than any published previously by any manufacturer.

Chances are—if you are a buyer of motors and controls—that you have already received a copy of this new Catalog 7000 by mail. However, if you have not received your copy, write, wire or phone your nearest Westinghouse district office. (Requests will be filled through district offices only — no mailing from Westinghouse headquarters at East Pittsburgh.) J-60552

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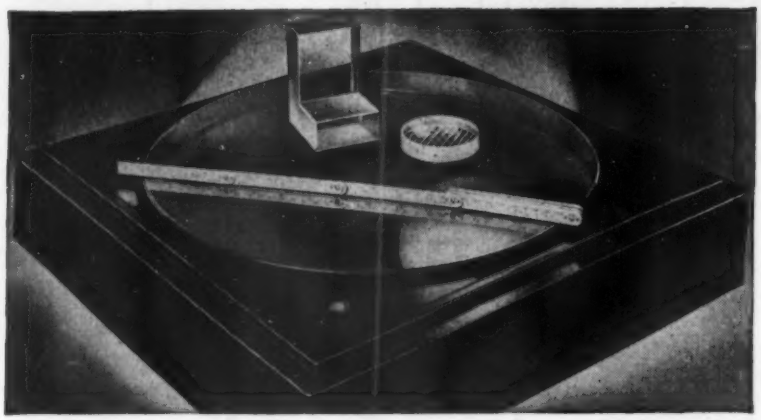
De-ion Linestarters

GEORGE SCHERR PRECISION PRODUCTS

belong in every plant doing accurate work . . .



The SCHERR Opti-Flat

This new glass surface plate is guaranteed flat within 50 millionths of an inch. Here is the ideal starting point for the finest tool and die work, for establishing locations, for height gage scribing, for sine bar work.

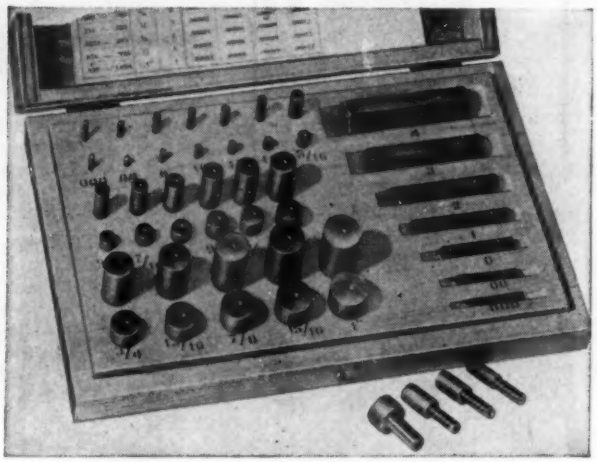
Available in 2 sizes: 12" diameter, 2" thick at only $58.00; 16" diameter and 3" thick at $88.00.

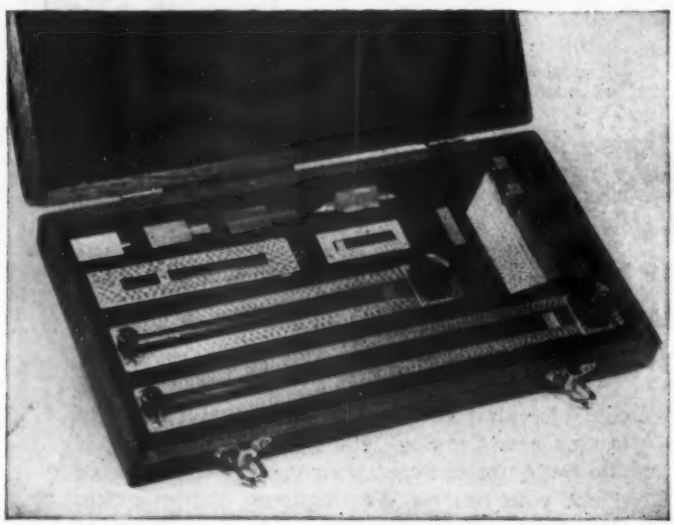
The Scherr Opti-Flat is a *worthwhile investment* for your shop. *Order Today!*

ATLANTIC PLUG GAGE BLANK
Emergency Set

Here is a new idea to solve your Plug Gage problems quickly and inexpensively. Order the ATLANTIC EMERGENCY SET *now*. It consists of 36 oil-hardened plug gage blanks in steps of 1/16" ready for finish grinding. With it you can make up any plug gage from .029" up to 1.000" in a few moments work on a cylindrical grinder.

COMPLETE SET with 7 handles costs $67.50. *Order now* or write for folder No. TD101. Individual blanks and handles in any quantity supplied at especially reasonable prices. Ask for quantity discounts.





The SCHERR Gage Block Utility Set

This new development in precision measuring instruments consists of holders, jaws, scriber, center points and height gage base all designed to permit you to transfer gage block accuracy directly to your work.

Every gage block user will find this set indispensable.

Set complete as shown $135.00 or write for folder TD-102.

GEORGE SCHERR CO.
INCORPORATED

200 LAFAYETTE STREET, NEW YORK 12, N. Y.

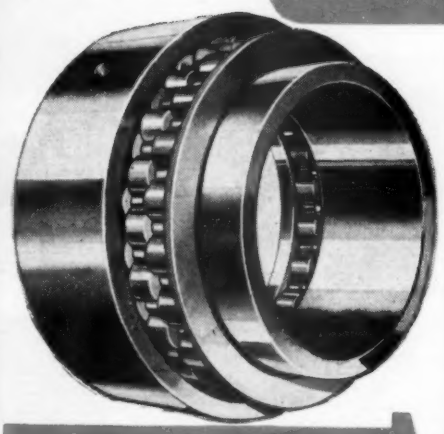
Send for this Helpful ENGINEERING DATA BOOK

Shows Full Line of STANDARD INTERCHANGEABLE SIZES

SPECIFICATION SHEET

MAIN SHAFT: *W-215 Orange Staggered Roller Bearings*

GEARS:



You'll find the answer to heavy duty bearing installations by consulting the Engineering Data Book on Orange Staggered Roller Bearings. This Data Book is built for designing engineers—gives all dimensions, capacities and tolerances in simplified form, set in large, easy-to-read type—shows many typical applications. It explains in detail the exclusive Staggered Roller design, which distributes the load over many small rolls instead of a few large rolls, giving Orange Staggered Roller Bearings greater load-carrying capacity and smoother running than conventional types. Study these advantages before specifying bearings for post-war products.

ORANGE "STAGGERED" ROLLER BEARINGS

FILL IN AND MAIL TODAY

ORANGE ROLLER BEARING CO., INC., 554 Main Street, Orange, N. J.
Please send me a copy of the Staggered Roller Bearing Data Book.

Name..... **Address**.....

Title..... .....

Company..... **City**..... **State**.....

Throughout America p
Semi-Automatic Thread Millers
hand or taper with equal facility
tages of multiple cutters . . . thread
single revolution of the work.

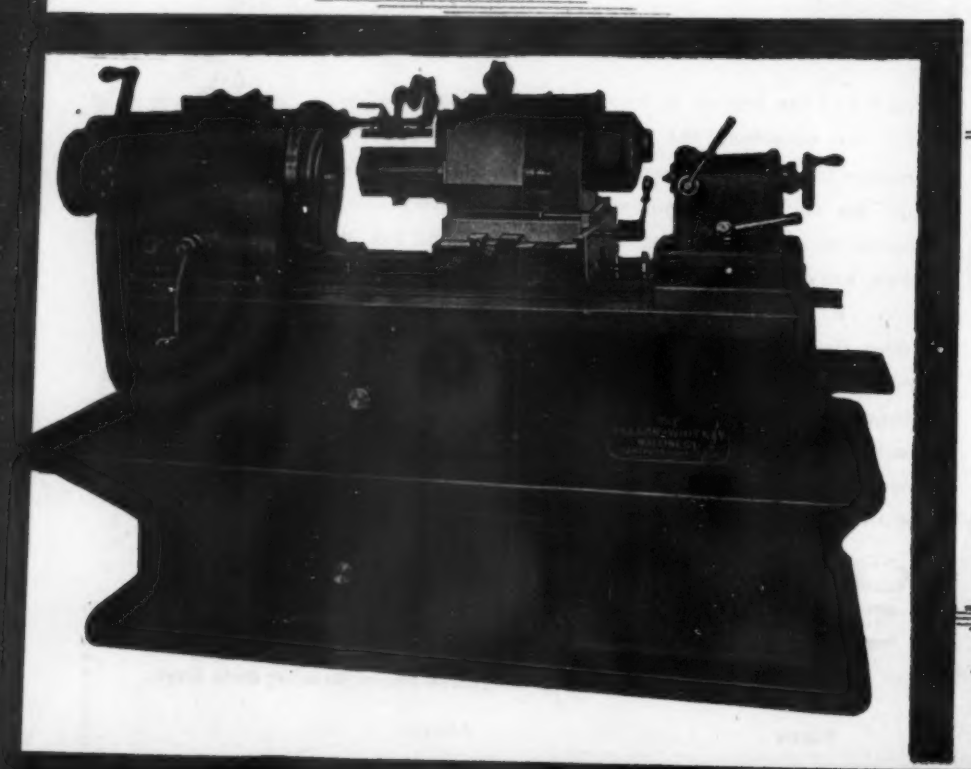
- Perfect threads are p speed and
convenience.
- Danger of spoiled work is gre minimized . . .
cision are obtained.
- Permits working of many previously hard-to-thread mat
accuracy, precision and speed.
- Produces right or left hand or taper threads . . . with equa

ded on to take the bottlenecks out
rman grinds . . . minimi
ages are made possibl
finishing after harden

- H and form and con
for gr
- Every H-W Tap
perfection of the fini
- Precise thread
speeded-up produc
- There's a H-W tap for
emblem on the taps you buy.

Hanson Process"

If you have a thread milling or tapping p



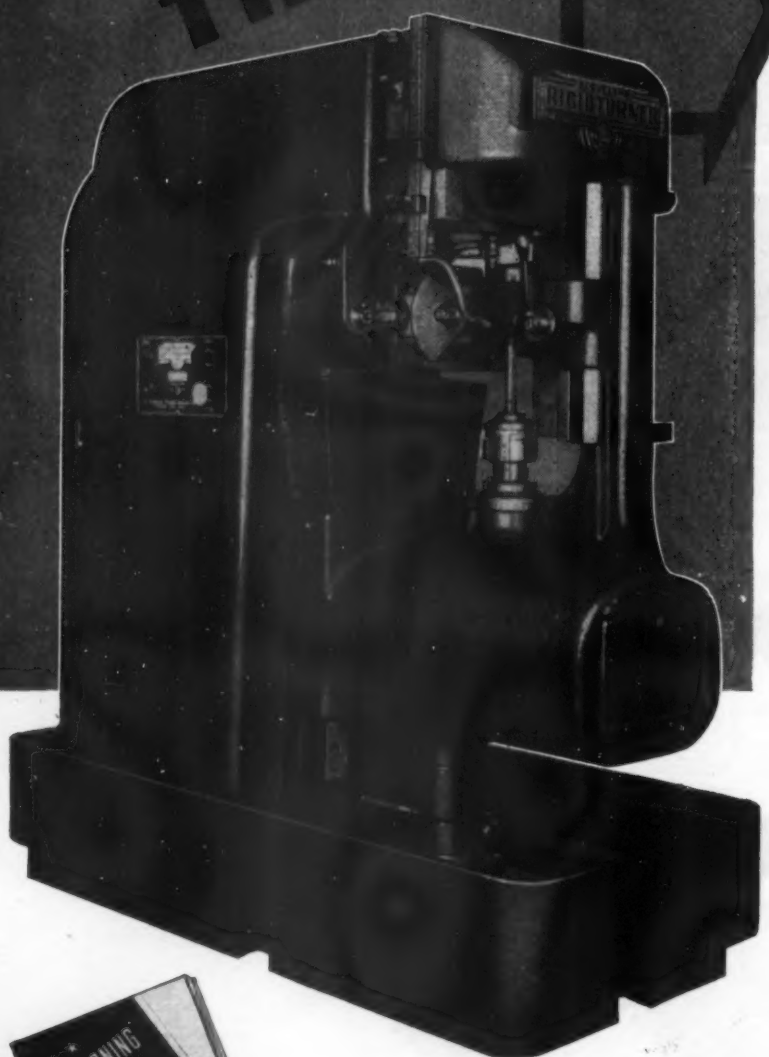
(Left) 8 x 16 inch Hanson-Whitney Semi-Automatic Thread Miller. Capacity: 8" diameter external with 2½" cutter; 8" diameter (max.) internal with 2½" cutter and 1" diameter (minimum) with 7/16" cutter.

The HANSON WHITNEY

LOOK FOR THIS EMBLEM

Y MACHINE CO. HARTFORD. CONN.

3 POINTS THAT MAKE FOR GREATER PRODUCTION · · · · LOWER COSTS ON THE RIGIDTURNER · · ·



1 more duplicate pieces per hour

2 faithful duplication to closer limits

3 tool changes made in less time

Today there's a definite need for more pieces per hour—closer tolerances—quick tool changes as provided in the Rigidhobber design and construction. Hundreds of these machines are now meeting critical production schedules with high precision work.

Operation is extremely simple—requiring operator to merely load the machine, press a button and machine completes operation and stops . . . ready for reloading. The work advances past the cutter which is rotated in timed relation to produce various diameters.

For greater production of multiple diameters—faithful duplication—and precision work specify the RIGIDTURNER.

The Rigidturner Bulletin tells how it operates—what work it will handle—and how it saves both time and costs on multiple diameter turning work. Write for yours today.

The CLEVELAND HOBBING MACHINE Company

General Offices:
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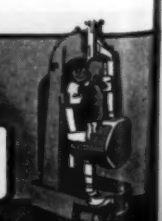
BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS



Proportional lighting SAVES COSTLY MISTAKES

In this precision milling operation, the Focalaire unit focuses intense illumination on the work, at the same time shielding the operator's eyes from glare.

FOCALAIRE Features

1. Quickly adjusted by simple ball and socket joints.
2. Shake-proof . . . resists machine vibration.
3. All parts are welded for strength.
4. Wire is run inside of tubular arms and has oil-resistant insulation.
5. Reflector is spot-welded to socket guard.
6. Six standard types, with regular machine-tool gray finish.
7. Special sizes can be made up from standard arms, reflectors and bases.

GENERAL + SUPPLEMENTARY = PROPORTIONAL LIGHTING

Proportional lighting is the right combination of general and supplementary lighting which produces excellent seeing conditions at critical work areas. For supplementary lighting, Westinghouse offers a complete new line of Focalaire units.

These convenient units are available in a variety of standard sizes and styles for bench or table operations, small machines, and large machine tools. Other sizes can be quickly assembled from standard bases, arms and reflectors. All are designed for convenient mounting and easy, firm adjustment.

For full information, call in your Westinghouse Lighting Distributor, or write Westinghouse Electric & Mfg. Company, Department 7-N, East Pittsburgh, Pa. Ask for B-3310. J-04000

Westinghouse

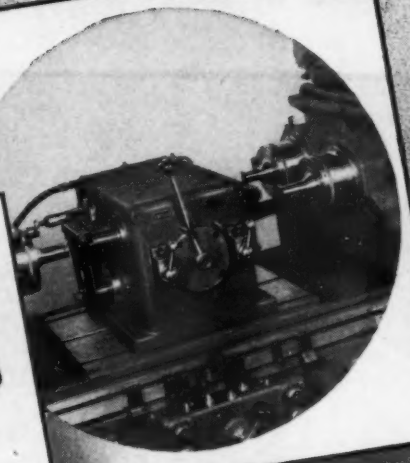
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Lighting Equipment

A File of EX-CELL-O

FIXTURES

To right: Typical set-up designed and made by Ex-Cell-O for standard boring machine. Used to semi-finish both ends of steel articulated rod at a high production rate with maximum efficiency and economy.



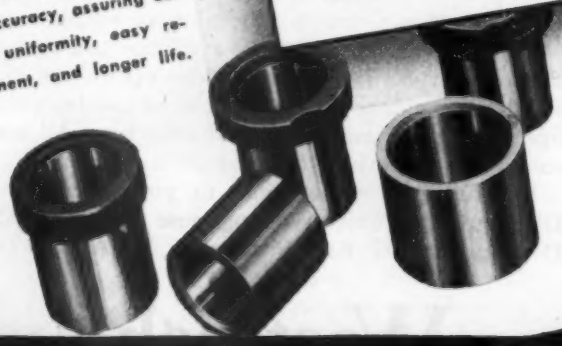
CONTINENTAL STANDARD and SPECIAL CUTTING TOOLS (High Speed and Carbide)

PRECISION PARTS

The machining of hardened and ground precision parts "to aircraft accuracy" is another Ex-Cell-O specialty. Operations performed to close tolerances and with exceptional finish include boring, turning, facing, grooving, chamfering, broaching, and thread grinding. Ex-Cell-O's extensive production of precision parts, using Ex-Cell-O precision machines and cutting tools, has increased output in the aircraft and other industries without sacrificing high accuracy standards.

DRILL JIG BUSHINGS

Ex-Cell-O drill jig bushings (A.S.A. Standards) are made with accuracy, assuring absolute uniformity, easy replacement, and longer life.



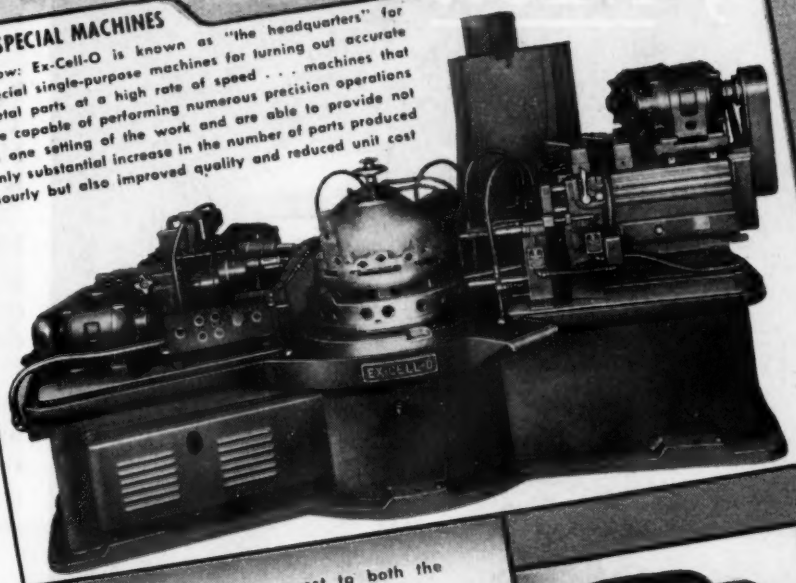
Below: Ex-Cell-O's new catalog on precision machine tools, cutting tools, and other Ex-Cell-O precision products. Contains illustrations, descriptions, and specifications. A copy will be mailed free to any executive requesting it on his business letterhead. Ask for Ex-Cell-O Catalog No. 27121.

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES • BROACHES AND BROACH GRINDING MACHINES

Production Aids

SPECIAL MACHINES

Below: Ex-Cell-O is known as "the headquarters" for special single-purpose machines for turning out accurate metal parts at a high rate of speed . . . machines that are capable of performing numerous precision operations in one setting of the work and are able to provide not only substantial increase in the number of parts produced hourly but also improved quality and reduced unit cost

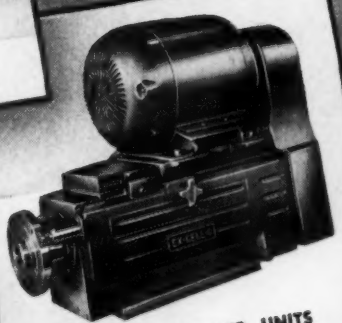


STANDARD MACHINES

Ex-Cell-O precision machine tools —for boring, turning, facing, thread grinding, broach sharpening, tool grinding, lapping —are sound in design and construction. The simplicity of their operation and the substantial production they attain on an economical basis, make these Ex-Cell-O standard machines of practical interest to both the manufacturers who install them and to the men who operate them.

GRINDING SPINDLES

Many thousands of Ex-Cell-O precision grinding spindles are in daily use throughout American industry



HYDRAULIC POWER UNITS

They provide an economical method of drilling, reaming, countersinking or spot-facing. Also may be used as prime movers or drivers for other machine units.

XLO

EX-CELL-O *for* PRECISION

IN your production plans for now and the future, take advantage of Ex-Cell-O's substantial background of practical engineering experience in the designing and manufacturing of precision machine tools and Continental cutting tools. Send today for General Products Folder No. 27132.

EX-CELL-O CORPORATION • DETROIT 6

HYDRAULIC POWER UNITS • GRINDING SPINDLES • DRILL JIG BUSHINGS • CONTINENTAL CUTTING TOOLS • TOOL GRINDERS • DIESEL FUEL INJECTION EQUIPMENT • R. R. PINS AND BUSHINGS • PURE-PAK MILK CONTAINER MACHINES • PRECISION AIRCRAFT AND MISCELLANEOUS PARTS

Yes, Men Make Motors!

NO MACHINE KNOWN can duplicate the skill of Sam Meister, left, of Allis-Chalmers Norwood Works.

Holding an acetylene torch in his right hand, a silver alloy rod in his left, Sam silver-brazes end connections of Allis-Chalmers' "Indestructible Rotor."

Round and round the connections he works — expertly flowing in molten alloy to form a joined structure that can withstand as much heat as though it were a single die-casting.

No machine can do that job — and no machine can fully test how well it is done.

There's only one test . . . wait 5, 10, 15 years and *see.*

And that's the test in which Allis-Chalmers motors have proved over the years that they're *great* motors. That's why you hear it said so often: *"You can depend on Allis-Chalmers Motors!"*

• • •

YES, HUNDREDS of Allis-Chalmers men—craftsmen like Sam Meister — know they have a big personal stake in every Allis-Chalmers motor. When they build a great motor for you, they're making a *friend* . . . and they know that's something no company and its workers can have too many of.

Next time *you* need great motors contact our district office. Or write direct to ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

A 1730

A-C VICTORY PEACE

YOU CAN DEPEND ON ALLIS-CHALMERS MOTORS

PUMPS

FOR VARIED INSTALLATION REQUIREMENTS

For Lubrication — Supplying Coolant — Circulating Purposes — Transfer Work — and Hydraulic Installations

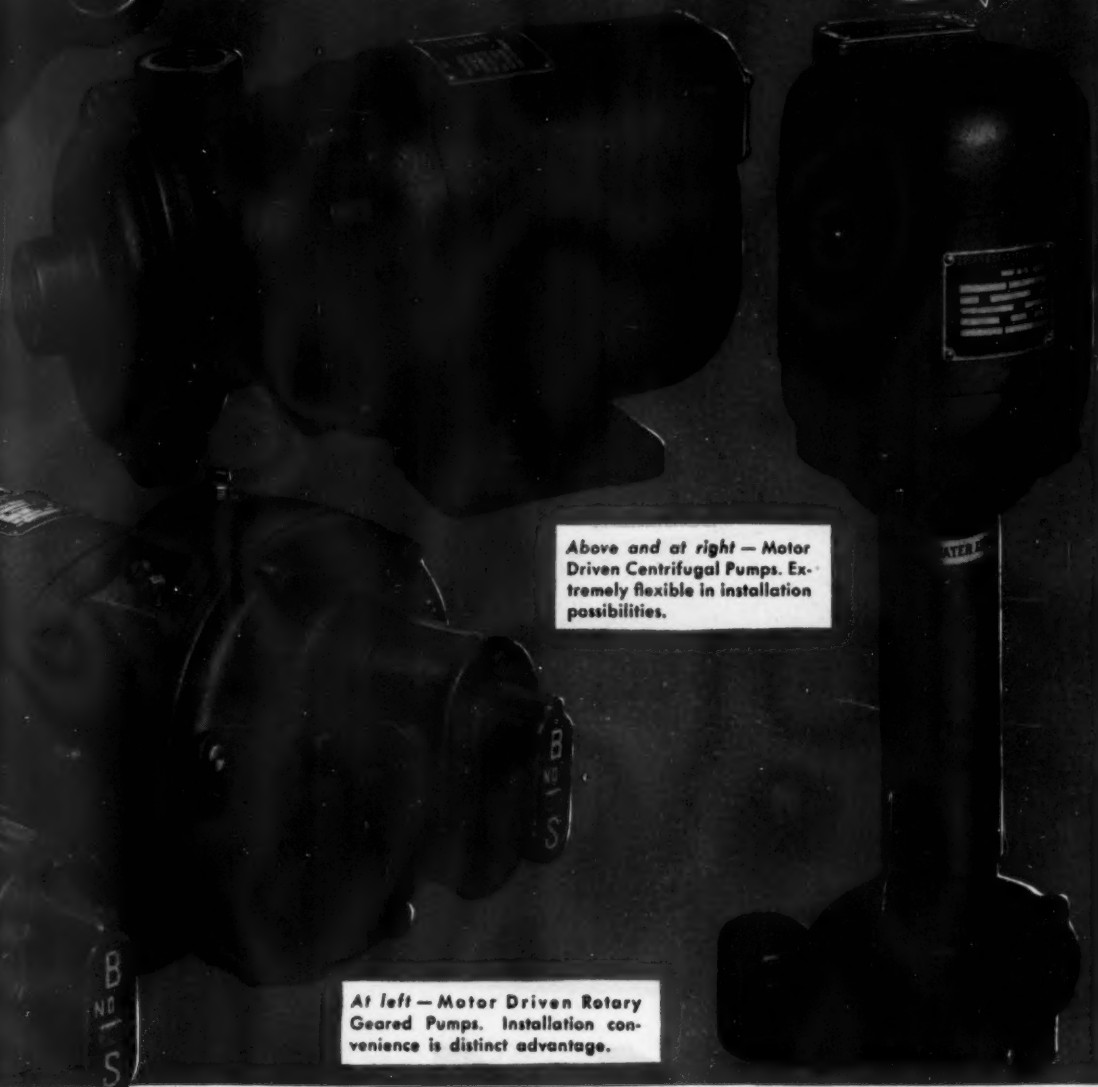
Catalog showing complete line including full characteristics, performance charts and engineering data sent on request.

GEARED — VANE — CENTRIFUGAL
MOTOR DRIVEN

DELIVERIES ARE GOOD ON MANY MODELS

BROWN & SHARPE MFG. CO.
PROVIDENCE 1, R. I., U.S.A.

Above—Rotary Geared Pumps (upper, with spur or spiral gears; lower, with herringbone gears for pressures up to 500 lbs. per sq. in.).



Above and at right — Motor Driven Centrifugal Pumps. Extremely flexible in installation possibilities.

At left — Motor Driven Rotary Geared Pumps. Installation convenience is distinct advantage.

BROWN & SHARPE

Surface Broaching

throughout the metal working industry

★ Surface broaching as a means of producing more parts—at lower costs—and with closer tolerance has been making rapid strides in many branches of the metal working industry. On wartime products such as ordnance, aircraft and military vehicle parts surface broaching has helped greatly in speeding materiel to the battle front. In planning for postwar products it will pay to investigate the advantages of this high production machining method.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

MOVE UP THE SCHEDULE ☆ WIN THE WAR QUICKER

Footburt Patented Tooth Form

FOOTBURT *Surface Broaching*

RE-TOOLING BY P&J IS A SOUND INVESTMENT IN *FUTURE LOW COST PRODUCTION*

FAST WORK ON BLADE GEARS TODAY . . . .

This P&J Automatic Chucking and Turning Machine — Model 6 DREL — set up for machining forged steel propeller blade gears — handled the job in an average floor to floor time of 15.15 seconds per place. Operations included rough boring, facing, rough turning, form facing, rough facing, semi-finishing, and finishing.

WITH CHANGE-OVER POSSIBILITIES FOR *Tomorrow* . . .

When this P&J Chucking Machine was purchased, its owner invested in tooling possibilities far in advance of the immediate set-up requirements. Now advantage can be taken of the versatility in P&J design which opens up great possibilities for use on future work by retooling.

All signs point to *low cost* as the essential objective in postwar production. It is, therefore, well to consider *now*, the cost-cutting potentialities of your present P&J Equipment. Our engineers are prepared to work with you. We suggest that you outline your postwar problems and ask for our re-tooling recommendations.

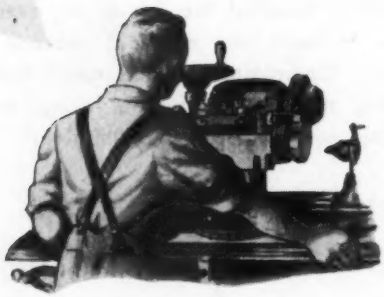
BUY BONDS TILL IT REALLY HURTS — *HITLER*

P & J REBUILDING SERVICE

P&J is prepared and equipped to rebuild your present P&J Automatics to original productivity and accuracy. Rebuilding in our shop also provides an opportune time for re-tooling.

POTTER & JOHNSTON MACHINE CO., PAWTUCKET, R. I.

This MID-WEST Super-Cut Wheel SOLD ITSELF the "HARD WAY"



Mounted on a surface grinder in the cutter grind department of a large war plant this MID-WEST SUPER-CUT wheel (Type 1, 10 x ¾ x 3, 2.46 KY6) was put through a test few, (if any) other wheels could withstand.

The competing wheel the company had been using for grinding high speed cutting tools was removing from .006 to .007 inches stock per cut. Its edges were broken. It was generating too much heat and the finish it produced was "just satisfactory." A MID-WEST SUPER-CUT wheel was mounted on the machine and the operation continued, using the same feeds and speeds. The edges of the wheel remained sharp and clean, virtually no heat was generated and the finish was much better.

THEN THE OPERATOR GAVE OUR WHEEL THE WORKS! Stock removal and cross-feed were changed to .020 inches — a veritable hogging operation. At one time the wheel was crowded so hard it actually stopped the machine! But under these conditions the wheel removed stock easily — without burning the tool and left a good finish. Obviously MID-WEST SUPER-CUT wheels were ordered for that important operation.

MID-WEST SUPER-CUT WHEELS, ideal for tool room work, are engineered for fast-cutting and smooth finishes. Made in two types—red and white—and with a range of grain and grade sufficient to handle any high speed steel tool operation.

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

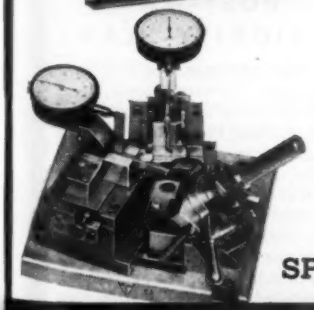
1960 E. Milwaukee Avenue — Detroit 11, Michigan

PRECISION GAGES and CARBIDE TIPPED TOOLS

Sound engineering design and skilled craftsmanship give Metro Gages and Carbide Tipped Tools the dependable precision that assures uniform accuracy at all times. Speeds up production on the most exacting machine operations.

Metro Standard Gages and Carbide Tipped Tools are available for immediate delivery through your Metro distributor. Special gages and tools designed and produced to meet exacting specifications.

Write for Your Copy
New 36 Page
Metro General Catalog
No. 102



ARMY E NAVY

SPECIAL GAGES

PLUG AND RING GAGES

All types, plain, progressive, extra long Plug Gages. Carbide Plug and Ring Gages.

THREAD PLUG AND RING GAGES

Manufactured in accordance with A. G. D. Standards. Gages precision lapped. Special gages to order.

CARBIDE TOOLS

Standard and Special—for machining of steels, cast iron, brass, bronze, aluminum and non-metallics. Available right or left hand.

METRO

TOOL AND GAGE CO.

4240 PETERSON AVE.
CHICAGO 30, ILL.

PRECISION

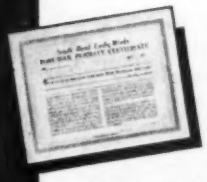
— AS VITAL IN WAR AS IN PEACE

SOUTH BEND
16" TOOLROOM LATHE

In every theater of war South Bend Lathes are holding to their pre-war traditions for dependable precision. In the mobile machine shops of our mechanized forces they duplicate factory tolerances on intricate parts needed for emergency repairs on guns, tanks, trucks and other essential equipment. On board many of the Navy's fighting ships, where high precision is an absolute requirement, they are also depended upon for maintenance and repair of mechanical equipment. In the repair bases of the Air Forces they play an equally important part in keeping planes in service. Sometimes small South Bend Lathes are even flown to remote locations for making quick repairs on grounded planes.

In all classes of war service these lathes are doing fine precision work—not only with the armed forces but also in industry where dependable accuracy is as vital as speed and versatility in meeting war's urgent production schedules.

When civilian production is resumed South Bend precision will again prove as indispensable to peace-time industry as it is now for exacting war work. Embodying the improvements developed to meet war production requirements, South Bend Engine Lathes and Toolroom Lathes will be available, also the South Bend Precision Turret Lathes having ⅜" and 1" collet capacity.



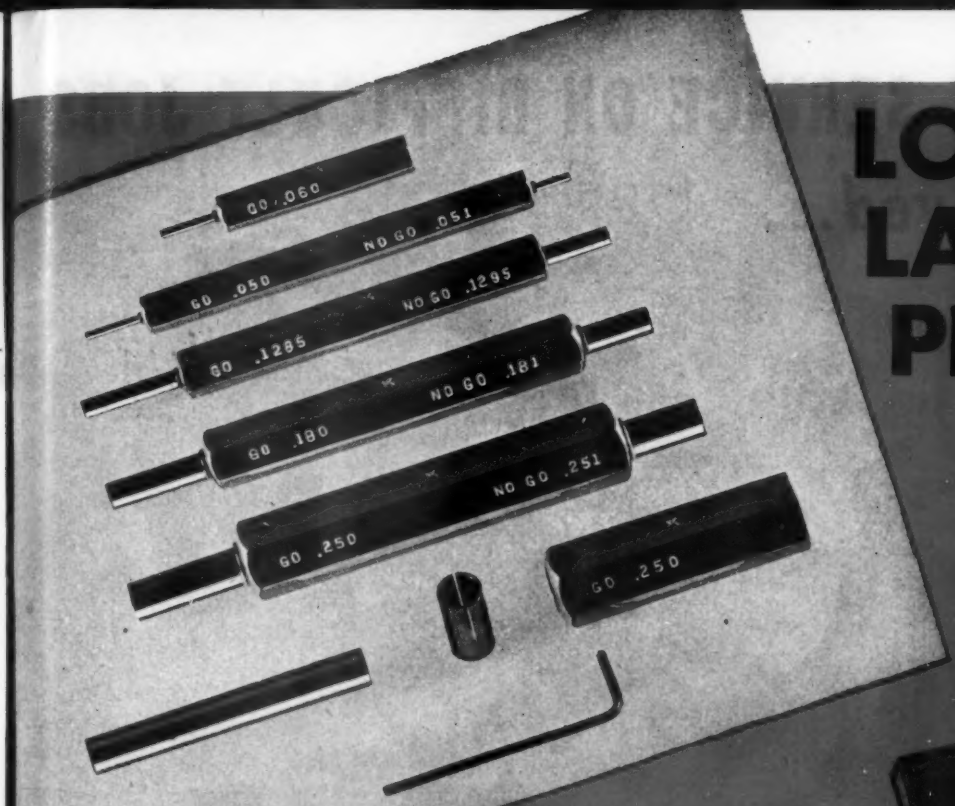
POST-WAR PRIORITY PLAN

To those who cannot qualify for a war-time priority, South Bend Lathe Works offers a practical Post-War Priority Plan. You can place your order now for any South Bend Lathe. No deposit or down payment is required. We ask only that the order be placed in good faith. When civilian production is resumed, orders will be filled in the sequence established by the numbers of the Post-War Priority Certificates. Should conditions necessitate, the order may be cancelled at any time. Write now for details of this plan—and our Catalog No. 100-C.

BUY WAR BONDS NOW—SAVE FOR LATHES

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 37 YEARS • SOUTH BEND 22, INDIANA



WIRE TYPE PLUG GAGE SET No. 60. These gages provide an accurate means of measuring small holes and also standards for checking twist drills in sizes from 1 to 60. (.228" to .040 dia.) PRICE $325.00.

LONGER LASTING PRECISION

On Small Hole Measurements

Van Keuren WIRE TYPE PLUG GAGES

Taper insert plug gages in small sizes cost a lot per unit of usable surface. Van Keuren Wire Type Plug Gages give longer lasting precision because the entire 2" length of the gaging unit can be used. Split bushings and headless set screws clamp the wire units securely in the handle. When a unit becomes worn it may be ground off and a new section moved out.

All Van Keuren Wire Type Plug Gages are made to a standard tolerance of +.00005" —.00000" on Go units; ±.000025" on No Go units. Closer or wider tolerances can be supplied if desired.

Van Keuren Wire Type Plug Gages are but one of the many types of measuring equipment in which we specialize. Write for Catalog 32 describing our complete line. More than a catalog! . . . It is a valuable handbook of precision measuring methods.

Van Keuren

THE 25th YEAR CO., 176 WALTHAM ST., WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles

DEPENDABLE SERVICE ON DIFFICULT JOBS

has been proved...

. . . IN "THE TOOLS YOU BUY AGAIN"

Consistent, proved performance of UNION TOOLS under every kind of condition eliminates any need for taking chances in the selection of small tools. You can safely take it for granted that the UNION LINE offers tools to meet your most difficult machining operations. Small tools bearing the name "UNION" are your assurance of speed, accuracy, long-life and economy. To use them is to prove their outstanding value in long, hard service.

THE UNION LINE

Twist Drills—Milling Cutters—Reamers—Hobs—Slitting Saws — End Mills — Taps — Dies — Screw Plates—Profile Cutters.

UNION TWIST DRILL COMPANY, Athol, Mass.

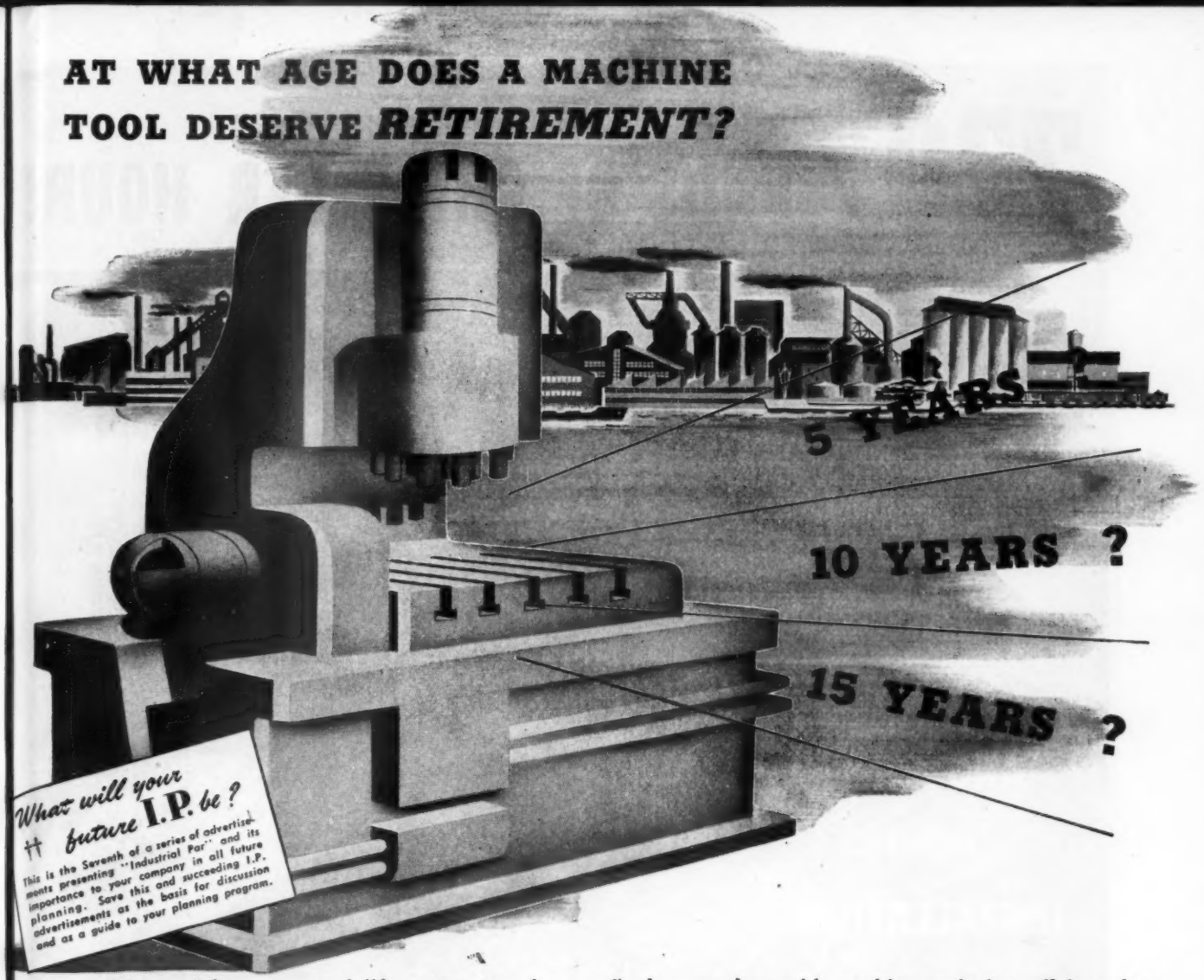
STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 5527 Woodward Ave.

MANUFACTURING DIVISIONS

S. W. Card Mfg. Co., Div., Mansfield, Mass.; Butterfield Division, Derby Line, Vt., and Rock Island, Quebec.

UNION

AT WHAT AGE DOES A MACHINE TOOL DESERVE *RETIREMENT?*


5 YEARS
10 YEARS ?
15 YEARS ?
What will your future I.P. be?
This is the Seventh of a series of advertisements presenting "Industrial Par" and its importance to your company in all future planning. Save this and succeeding I.P. advertisements as the basis for discussion and as a guide to your planning program.

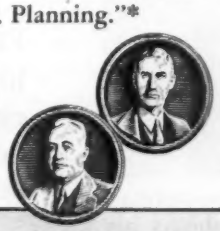
Does a machine tool have a normal life expectancy of a stated span of time?

Yes — it varies with the machine, of course, and the standards of production and performance to which it is expected to measure up, but time is not the only yardstick to apply to determine when it should be "written off."

For a machine tool becomes obsolete not so much by age but by an inexorable law of industrial competition. Any machine tool — standard or special — that can increase output per man-hour and reduce production costs "puts the finger on" less efficient machines — dooms them to comparatively early discard. For no manufacturer can long afford to produce with machine tools less efficient than those of his competitors.

Manufacturers who are planning to offer better products with price tags that appeal to mass markets have taken the first step to postwar security and employment. Machine tools — the most modern and advanced types — will be an important part of their production planning — indispensable equipment to win the fight for lower costs — to provide jobs and wages for the greatest number of workers — to attain or excel *Industrial Par* as presented in this advertisement as "Spotlight Facts for Your Future I. P. Planning."*

Milwaukee Machine Tools



KEARNEY & TRECKER CORPORATION
MILWAUKEE 14, WISCONSIN

Spotlight facts for your future* **I.P. *planning*

*Production methods — developed in wartime — increase man-hour output; pent-up buying power — released in peacetime — demands increased production.

*The rate of 2½% increase per year output per man-hour, established by a 12 year record of industrial production, can be expected to reach at least 4% per year — compounded.

*Manufacturers must set a goal of 50% increased output per man-hour every 10 years — to maintain a high level of national prosperity and achieve its benefits in terms of security of jobs and wages for the greatest number of workers and the volume production of more goods for more people at lowest cost.

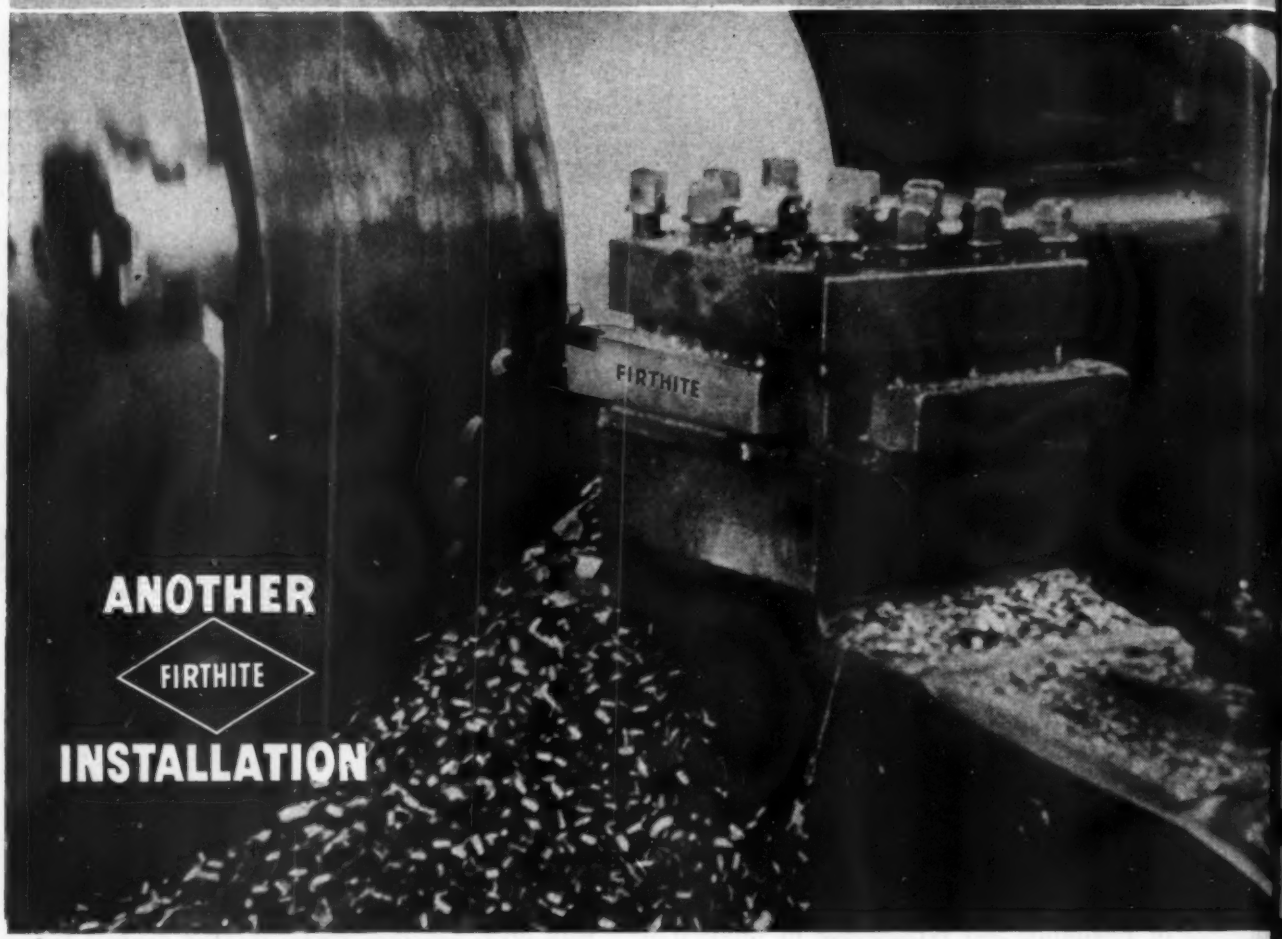
*Machine tools — the most modern, most efficient — are recognized as the most effective implements of mass production and increased output at lowest cost — but only continual replacements with the newest and finest machine tools assures full productive capacity. *Such replacements yearly should be equal to 10% of the total machine tool investment — in keeping with increased output.*

*The cost of machine tools is insignificant in terms of their productive power . . . from 1927 to 1937, according to census reports, American manufacturers had only a total of about 2% invested yearly in machine tools in ratio to a total volume of 9 billion dollars' worth of production annually.

†† **Industrial Par** — *the constantly increasing output per man-hour equal to approximately 50% every 10 years.*

BACK THE ATTACK . . . BUY MORE BONDS

730 POUNDS OF CHIPS PER HOUR!



Simultaneously in **boring** these castings, FIRTHITE Tools take five shocks per second on a severe, interrupted cut.

On **rough turning** this 20″-dia. gray iron casting, wit only chuck support, a FIRTHITE Sintered-Carbid Cutting Tool takes a ½″ cut, 0.042″ feed at 17 per minute—far beyond the capacity of high-spee steel tools.

FIRTHITE cuts clean and free with little pressure high speeds . . . produces remarkably smooth an even finish. For **super** production, on **any** metal non-metal, investigate FIRTHITE. Write today fo descriptive literature.

ARMY E NAVY

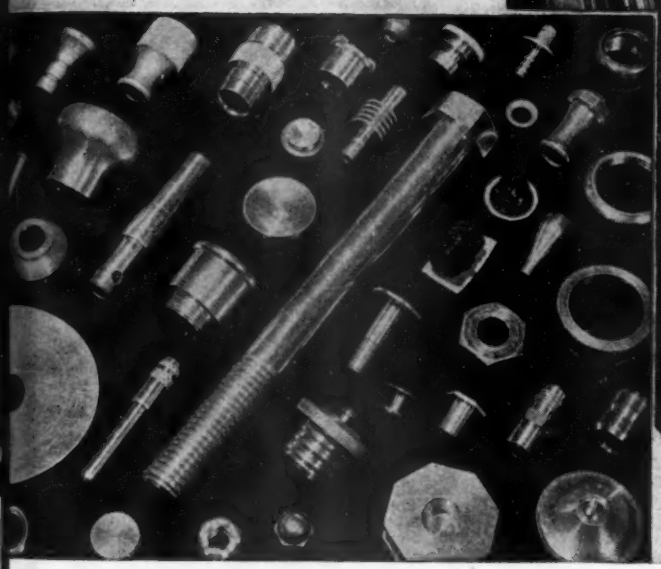
Firth-Sterling
STEEL COMPANY

Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA - CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

MAKERS OF HIGH-SPEED STEELS, TOOL AND DIE STEELS, AND SINTERED CARBIDES

Alcoa

WAS AGREEABLY DISAPPOINTED



Alcoa Aluminum products for your assembly line or Alcoa stock for your screw machines

With the millions of aluminum screw machine products required at the start of the war, and hundreds of new fabricators coming into the picture, a flood of requests for help was expected. Alcoa had always served as a clearing house where all fabricators could come for information on aluminum alloys, the design of parts and tools, machine speeds, feeds and lubricants. Alcoa's engineers had given freely of their time to help others get into aluminum production.

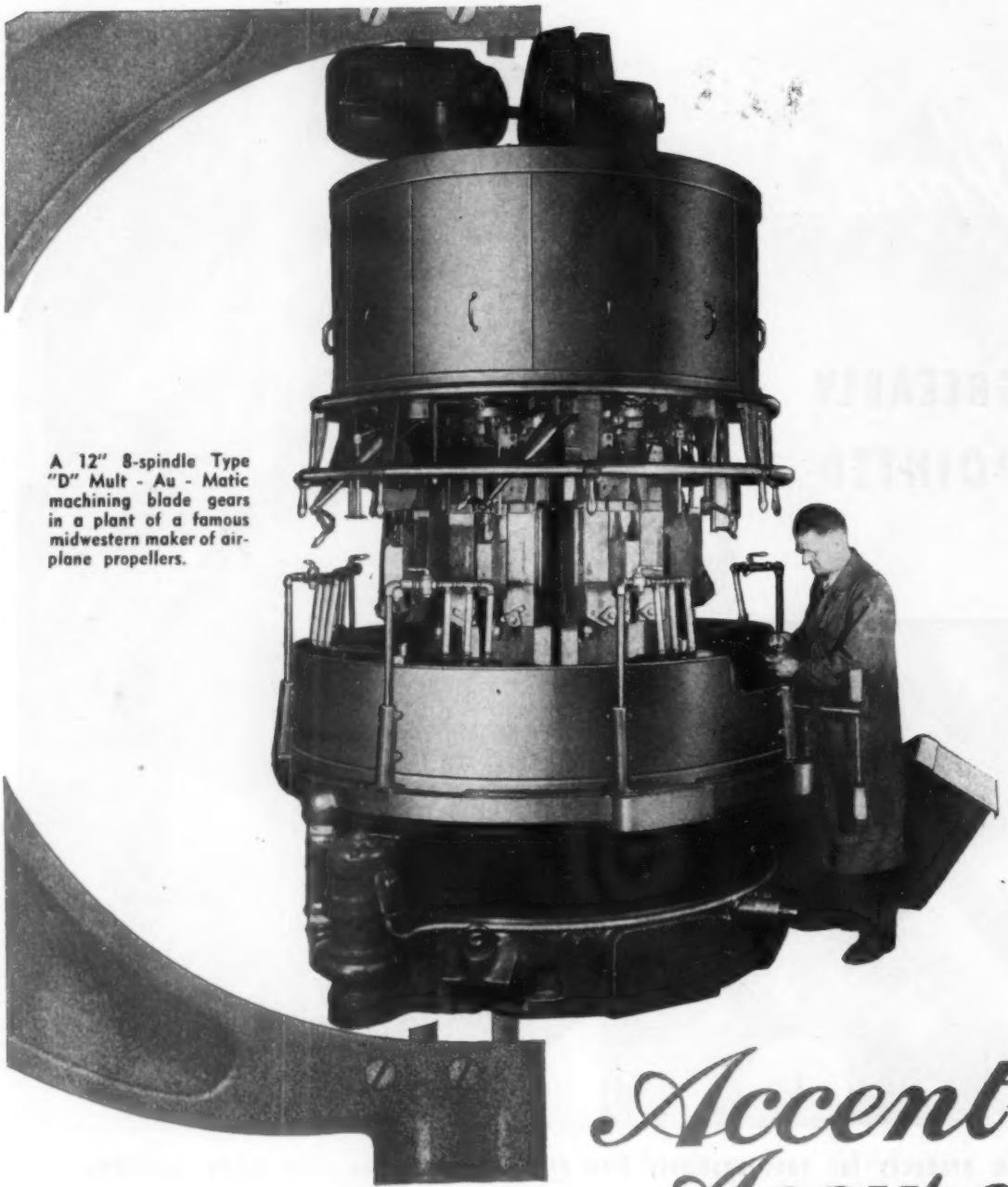
But the spadework, getting industry ready to swing into aluminum production, had been well done before the war. As a result, a surprisingly small number of requests for help developed.

Alcoa's Screw-Machine-Products Division serves a double purpose. Our skilled personnel manufactures untold millions of pieces for use in the war effort, parts requiring great accuracy. This division serves, too, as a proving ground for new alloys and improved methods of production.

It is Alcoa's intention to continue to aid industry in employing lightweight, strong and fast-machining Alcoa Aluminum Alloys to best advantage.

Winning the war comes first. But, as the manpower situation permits, aluminum is now being used for other-than-war purposes. Our representatives will be glad to discuss the availability of aluminum with you. Write to ALUMINUM COMPANY OF AMERICA, 2107 Gulf Bldg., Pittsburgh 19, Pa.

ALCOA ALUMINUM



A 12" 8-spindle Type "D" Mult - Au - Matic machining blade gears in a plant of a famous midwestern maker of airplane propellers.

Accent on Accuracy

When you think of the many Mult-Au-Matics now busy in the war plants of the nation, you probably think first of the increased output they effect, by drastically lowering machining time per part.

True, the Mult-Au-Matic method, machining six or eight parts simultaneously, does result in vastly greater output. But it is well to remember too, that Mult-Au-Matics turn out work that stands up to aviation's rigid standards of accuracy — or you would not find them in these plants, no matter how superior their increased output.

Consider MULT - AU - MATIC maintained Accuracy on all work, even in the face of inexperienced operators due to the present manpower shortage.

THE BULLARD COMPANY BRIDGEPORT CONNECTICUT

"Put it on the Blanchard"

...GET THESE ADVANTAGES

Production ✓
Adaptability
Fixture Saving
Operation Saving
Material Saving
Fine Finish
Flatness ✓
Close Limits

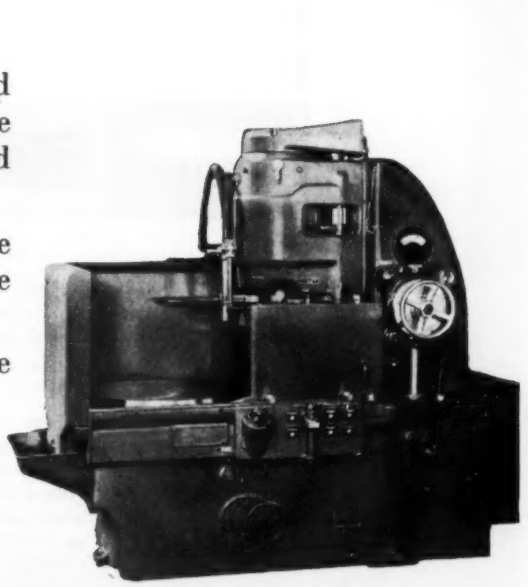
Grinding Cast Iron Rings

Five of these 12″ x 1½″ cast iron rings are securely held on the 36″ magnetic chuck of a No. 18 Blanchard Surface Grinder. Twenty pieces (40 surfaces) per hour are ground flat and parallel, removing $^{1}/_{64}$″ from each surface.

The illustration shows the narrow surface being ground, the opposite side is a ring of 8″ inside diameter and 12″ outside diameter and is ground flat within .0005″.

For the multiple grinding of parallel surfaces such as these "put it on the Blanchard".

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



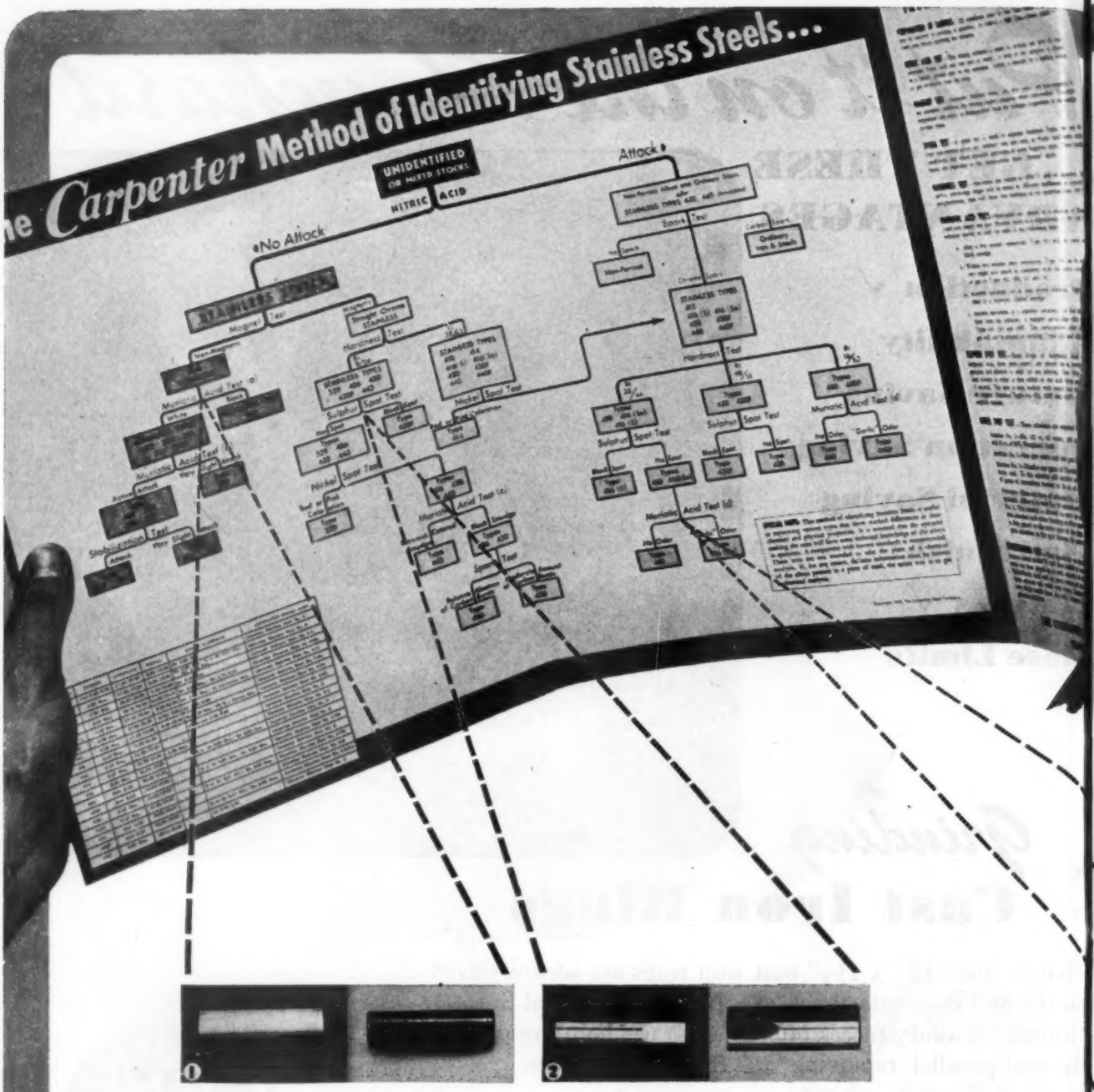
No. 18 BLANCHARD SURFACE GRINDER

BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

...Carpenter Method of Identifying Stainless Steels...



1. MURIATIC ACID TEST (a)—Specimens are placed in a solution of Muriatic Acid (one part water, one part Muriatic Acid) at a temperature of 180° to 190° F. After a five minute immersion, Type 303 can be identified by a coating of heavy black smudge.

2. SULPHUR SPOT TEST—Three drops of Sulphuric Acid solution (one part Sulphuric Acid, three parts water) are placed on a newly-ground spot on the specimen and allowed to react for one minute. One drop of a 5% solution of Lead Acetate in water is then added to the acid drop and allowed to react for 15 seconds. The spot is then washed with water and examined. A positive test for Sulphur (Stainless Types 416 (S), 420F and 430F) is the presence of a black sulphide deposit.

more than corrosion resistance

THE CARPENTER STEEL COMPANY • 109 W. Bern Street, Reading, Pa.

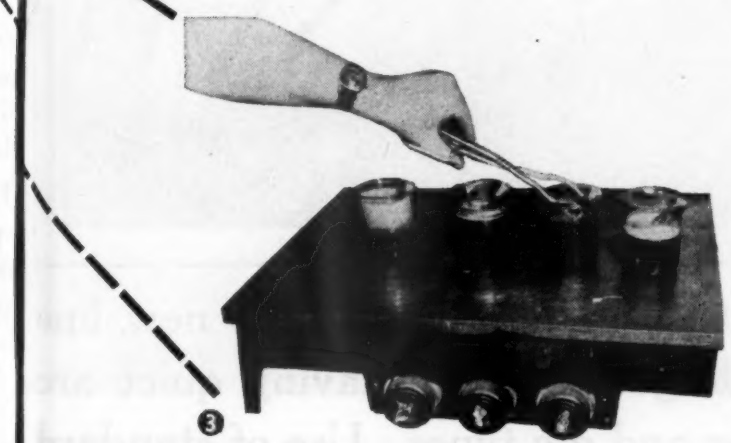
. . . Another New Help for Stainless Steel Users!

A Convenient Method for Identifying Stainless Steels

Even in the best regulated plants, steel stocks sometimes do get mixed. And if the stock happens to be Stainless Steel, you know the troubles a mix-up can cause in heat treating, machining, stamping, welding or other fabricating operations. So it's important to you to have a quick method for identifying Stainless that may become mixed in stock.

To help you meet this problem, the Carpenter Laboratories have developed a new and simplified chart for identifying various types of Stainless Steel. The chart diagrams and explains the nitric acid test, magnet, spark, hardness, and muriatic acid tests, sulphur spot and nickel spot tests, and the stabilization test, and shows when and how to use each one. By closely following the instructions on the chart, it is possible to check the identity of Stainless Steels which may be in question.

This chart can be used in your laboratory, to help your stockroom, warehouse or production department check on mixed stocks. Its convenient size makes it easy to use right on the testing table. To obtain a copy, simply send us a note on your company letterhead, indicating your title. Your request will receive prompt attention.

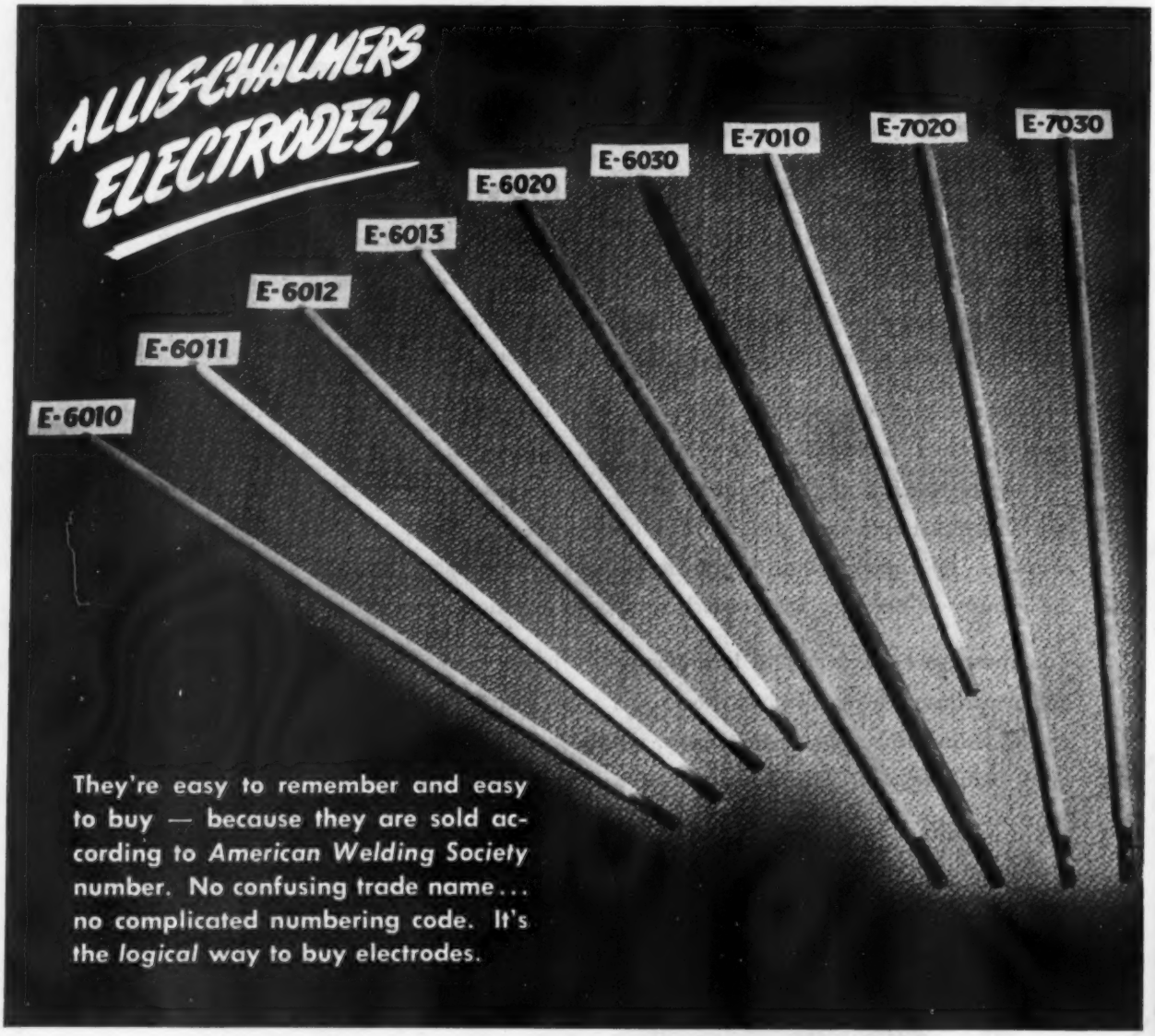


3. MURIATIC ACID TEST (d) —Immerse specimens in a separate container for five minutes, then remove them from the solution. A pungent garlic-like odor will be detected on Types 416 (Se) and 440F. This characteristic odor of Hydrogen Selenide gas will not be present in pickling Types 410 and 440.

Carpenter STAINLESS STEELS

BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

PRODUCT OF THE MONTH


ALLIS-CHALMERS ELECTRODES!
E-6010
E-6011
E-6012
E-6013
E-6020
E-6030
E-7010
E-7020
E-7030
They're easy to remember and easy to buy — because they are sold according to *American Welding Society* number. No confusing trade name... no complicated numbering code. It's the *logical* way to buy electrodes.

MILWAUKEE, WIS. — Allis-Chalmers announces new line of smooth-flowing arc welding electrodes having quiet arc characteristics . . . in both a-c and d-c types. Use of standard AWS number and color simplifies handling, makes selection easy. Write today for bulletin B6340.

A 1767

WE WORK FOR VICTORY — WE PLAN FOR PEACE

ALLIS-CHALMERS · MILWAUKEE · WISCONSIN

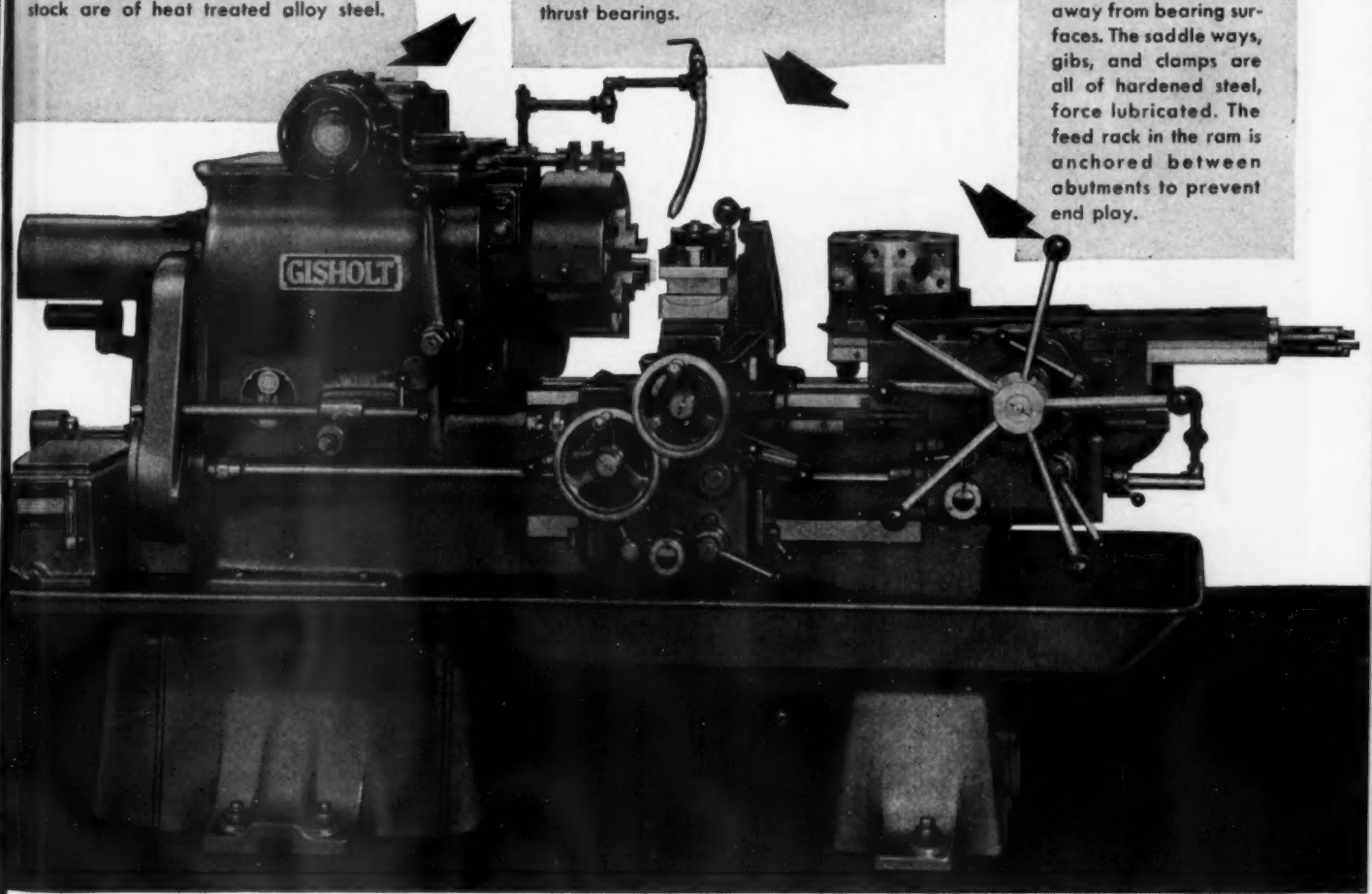
Durable!

Durability makes these Gisholt Universal Turret Lathes a sound long-term investment, assures increased production and lower cost for many years to come.

1 Headstock lubrication is by oil vapor with filtered oil carried directly to spindle bearings. Tapered roller and ball bearings on the spindle and all shafts preserve accurate alignment. All gears and shafts of the powerful headstock are of heat treated alloy steel.

2 An entirely enclosed apron forming a tight oil reservoir for positive lubrication of gear train by splash and by cascade. Forced lubrication to the hardened steel ways and the cross slide. Large diameter cross feed screw with opposed ball thrust bearings.

3 Husky, automatic turret clamp takes all the wear and strain off the locating pin and bushings. Coolant, scale and chips are carried away from bearing surfaces. The saddle ways, gibs, and clamps are all of hardened steel, force lubricated. The feed rack in the ram is anchored between abutments to prevent end play.



WHEREVER you look into a Gisholt, you'll find special provision for durability. From the rigid, integrally cast bed and headstock, and the wear-resisting, solid, hardened-and-ground steel ways, down to the smallest detail, Gisholts are designed to preserve their accuracy—their full power capacity—their easy operation throughout long years of service. Perfected over a period of nearly 60 years, ruggedly designed to withstand the demands for higher speeds and harder service, these Gisholts will produce at lower costs now—and years from now.

Complete information about Gisholt Turret Lathes is available on request.

GISHOLT MACHINE COMPANY • *1201 E. Washington Ave., Madison 3, Wis.*

Look Ahead...Keep Ahead...With Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

Another bad case of GALL

cured by

KENNAMETAL

ABOVE—Milling machine vise, with inserts of Kennametal at points "A" and "B".

UPPER LEFT—Galled surfaces of steel jaw and screw.

LOWER LEFT—Kennametal inserts minimize wear.

The superiority of Kennametal for wear-resistant purposes is graphicly demonstrated in this milling machine vise. The steel parts of the jaw and screw (enclosed in box "A") wore and tore under the twisting force exerted by the clamping mechanism. Thin discs of Kennametal—one brazed to the end of the screw, another recessed into the jaw at the abutting point—permit the jaw to be closed securely, and opened readily, with less effort. The performance of the vise has been further improved by inserts of Kennametal in the sliding surfaces on which the work rests, at points marked "B".

The high hardness of Kennametal (78 Rockwell C), and its unique non-galling property, provide resistance to abrasive wear that is up to 100 times that of steel. Kennametal's modulus of elasticity—2 to 3 times that of steel—minimizes possibility of deformation. Its unusual dimensional stability makes creep negligible.

Kennametal is available in a variety of standard shapes, or it can be furnished molded into almost any special form, limited only by reasonable proportions. We have supplied Kennametal . . . as accurately molded inserts for the customer to apply and grind as desired . . . mounted on parts furnished to us, and then finished by the customer or by us . . . embodied in elements or devices produced complete in our plant.

You can readily, and economically, incorporate Kennametal in the wear-areas of the machines you use, and the products you manufacture. Tell us your problem. We will suggest how Kennametal can solve it.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

BORING, DRILLING
***and* TAPPING**
GUN MOUNT CASINGS
to close tolerance on a
SUPER-SERVICE RADIAL

ARMY E NAVY

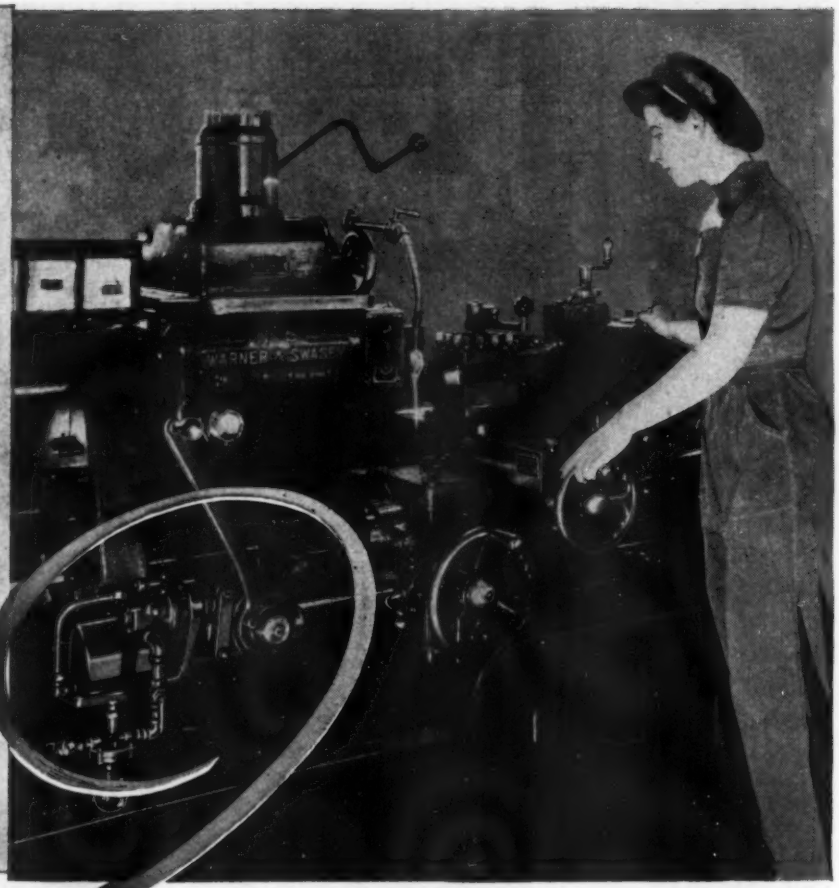
HERE'S a Super-Service Radial at the plant of American Machine and Metals, Inc., in Illinois, being used to bore, drill and tap holes up to 4.173" diameter on a gun mount pedestal casing approximately 4' high by 3' across base. Tapping involves 22 holes of various sizes. Limit of accuracy is .001. While production figures are not available for publication, we can say with assurance that the floor-to-floor time is exceedingly low. Summed up in the words of the operator "This machine handles easily —does a good job." Such commendation typifies the kind of report we receive from operators everywhere who speak from actual experience with Super-Service Radials.

Detailed information available on request.

THE CINCINNATI BICKFORD TOOL CO. OAKLEY, CINCINNATI 9, OHIO, U. S. A.

AN IMPOSSIBLE JOB FOR A GIRL?

Not with a Warner & Swasey Collet Chuck Booster!



THE De Laval Steam Turbine Co., Trenton, N. J., is a mighty busy plant these days. It is maintaining a splendid record of war production in the face of serious manpower shortage. One reason is their successful experience in employing women on many Turret Lathes.

The job, illustrated above, consists of turning, boring, and reaming a bronze pump sleeve. Because the job took frequent chuckings, requiring much manual effort to close the collet, it was impossible for a woman operator to take over. A Warner & Swasey man advised the installation of a Collet Chuck Booster.

One hour after the Booster reached the shop floor it was on the machine. Installation is simple. Now, women operators easily handle the job, and time-saving in chucking this particular piece has brought an increase in production of approximately 15%.

The turret lathe is run 24 hours a day, 7 days a week. *Increased production has paid for the installation of the Collet Chuck Booster in three months.*

Why not learn what Collet Chuck Boosters can do for you in greater production by reducing operator fatigue and saving chucking time. Your Warner & Swasey field man can give you full information on installation of these time-saving devices on your current model turret lathes—or write Warner & Swasey, Cleveland, Ohio.

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS...

WITH A WARNER & SWASEY

TURRET LATHES, SADDLE AND RAM TYPES • CHUCKING AND BAR TOOLS • TAPPING AND THREADING MACHINES

Termination Is Today's Problem

NEXT TO WINNING THE WAR, the termination of war contracts is the task of most importance to American industry.

That is not our statement, but a declaration by the War Department in Washington to war contractors.

The War Department is deeply concerned because quick termination, strange as it may seem, is closely related to successful prosecution of the war.

In a so-called "fluid" war, such as this one, many contracts must be ended and new ones begun. Only in this fashion, according to the War Department, can the rapidly changing needs for new and better weapons be met promptly.

"The quick and efficient termination of contracts and the clearance of war plants for other work," says the War Department, "has become an inseparable part of the war supply program."

Perhaps it is just as well that the problem of contract termination has risen now rather than be postponed until the day of gigantic cutbacks. If we learn to handle it expeditiously and intelligently now, the effect will be less devastating at the end of hostilities.

Weaknesses already have cropped out. In certain cases, notably at Detroit, the government itself failed to remove materials and parts from plants long after work had ceased.

In other cases the government has had hundreds of millions of dollars waiting for manufacturers to come and get if they would speed up the termination process.

It is a fact that on many contracts ended six to twelve months ago, contractors have not yet submitted claims.

The government believes that two factors are chiefly responsible for this situation. One is inexperience in organizing for termination and in training men for the job. The other is that some manufacturers do not give enough serious attention to termination. It is regarded as "a nebulous problem for some distant tomorrow."

The upshot of all that is being said about termination is that it is not too early to start doing something about it, though it may not yet have touched your business. Procrastination may do great damage to your plant and to all the people that comprise your working force.

Even if war business is still occupying your full capacity, you can do three things to anticipate T (Termination) Day.

You can appoint a top executive to organize a termination section of your business, you can set up a stock control system to avoid over-size inventories, and you can educate subcontractors in proper termination procedure.

We quote the War Department, "The orderly and rapid transition tomorrow from war to peacetime economy depends on how well today we solve the mounting problems of contract termination."

Burnham Finney

FLYING CORRUGATIONS...

When corrugations took to the air, Cincinnati Press Brakes answered the problem of producing many different sizes of corrugations in different thicknesses and kinds of material. Today they are used extensively in the stupendous program of the airplane industry . . . their accuracy, speed, and versatility make them a valuable production unit.

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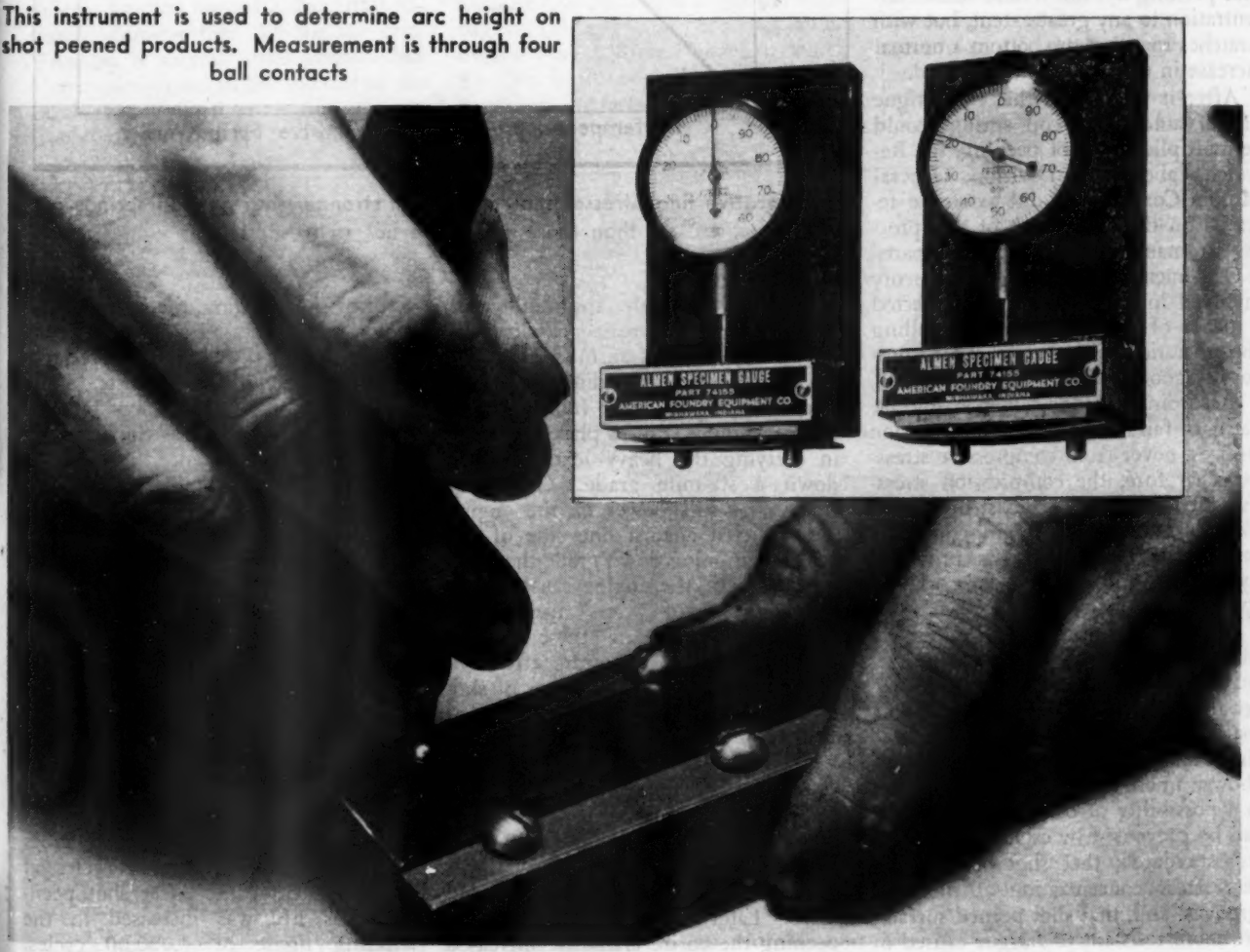
Fatigue Life of Stressed Parts Increased by Shot Peening

BY D. C. TURNBULL, CHIEF ENGINEER, AMERICAN FOUNDRY EQUIPMENT COMPANY

As an outgrowth of a cleaning process, shot peening is now used to add service life to many types of products. Tests and experiments will show how to get the best results

ABOUT 1936 it was discovered that shot blasting of clutch springs for cleaning also had the effect of cold working the metal surface. The rain of hardened shot acted like millions of tiny but effective hammer blows which produced a pitted effect on the spring surface. This process is now in more general use and is known as shot peening. Under the then prevailing theory of "stress raisers," which taught that the smoother the surface that was to be under stress, the less the notch effect, it was thought that roughening the surface would weaken such a spring. However, instead of lessening the fatigue life of the springs, shot peening increased life many times. From that time on, most spring manufacturers shot peened their products, using more

This instrument is used to determine arc height on shot peened products. Measurement is through four ball contacts



Test blocks and strips are used to determine the extent of shot peening required to achieve desired arc height

or less experimental standards as to what intensity of peening would give best results.

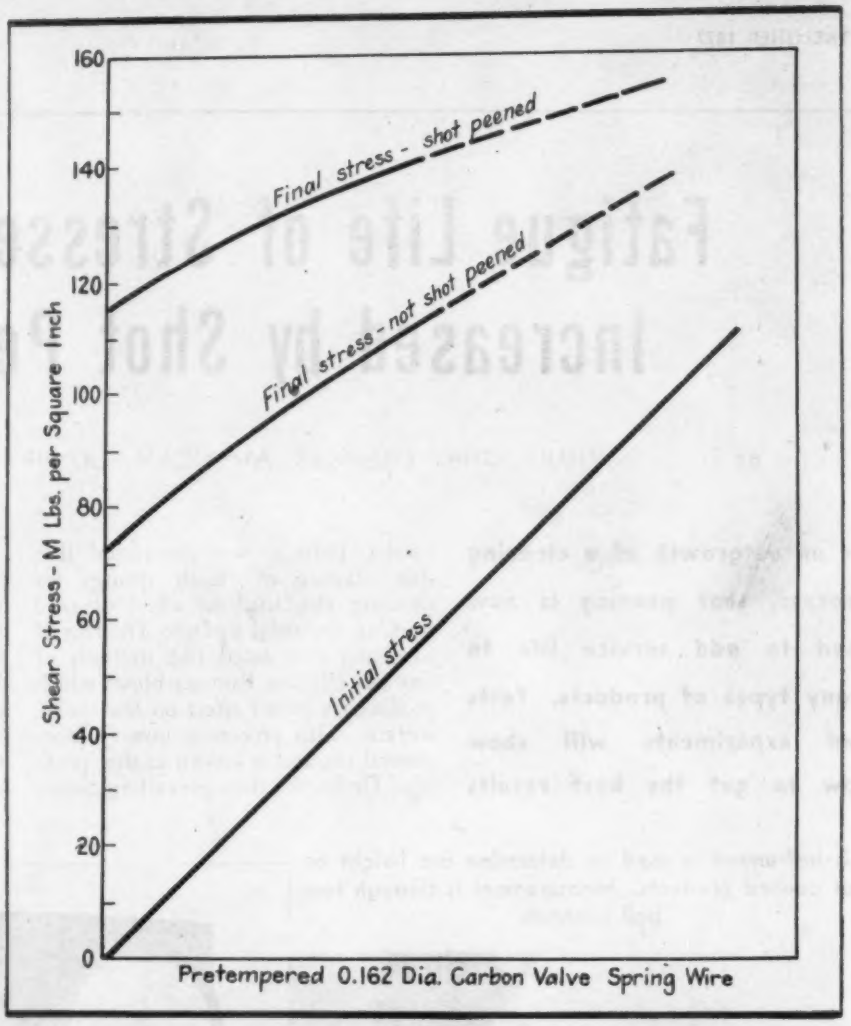
As the interest in shot peening increased, researchers learned more about it, and in 1940 Mr. F. P. Zimmerli of Barnes-Gibson Raymond Division of Associated Spring Corporation reported the following:

1. Shot peening did more to increase fatigue life of small springs than the use of any alloy steel.
2. On test springs, the fatigue range was 20,000 to 95,000 psi. This was increased through shot peening to 135,000 psi., maximum stress.
3. Exact details of shot peening intensity depend upon the machine and the type of work.
4. Heating of springs to 825 F. after peening resulted in the same stress range as before peening. Reblasting produced the same high fatigue resistance.
5. Springs pitted by shot peening have a greater fatigue life than those with a normal smooth surface.
6. Poor wire cannot be improved as much by shot peening as sound material.
7. On wire that was badly gouged, shot peening did not reduce stress concentration to any great extent, but with scratches round at the bottom a normal increase in endurance was obtained.

After it was found that the fatigue life of automotive coil springs could be multiplied by shot peening, the Research Laboratories Division, General Motors Corporation, did extensive research on the application of this process to many types of stressed parts. J. O. Almen developed the basic theory involved in the process and perfected a means of measuring and controlling the operation in order to secure uniformly good results.

According to Mr. Almen's concept, fatigue failures result from tension stresses, never from compressive stresses. Therefore, the compression stresses which are caused to exist in the unloaded state by shot peening directly reduce the tension stresses produced by the bending of such parts as leaf springs and torsion springs.

Additional research on the subject of shot peening by H. F. Moore, research professor of engineering materials, University of Illinois, is summarized in a report "Shot Peening and the Fatigue of Metals." His study shows, among other things, that there is a possibility of over peening, which can be prevented by establishing peening standards; that shot peening offsets stress concentration at fillets or grooves; and, that shot peened surfaces are more resistant to fatigue caused by corrosion pitting.



Comparative final stresses show how much stronger shot peened springs are than those which are not so treated

One of the early applications of shot peening to increase gear life was heavy-duty truck transmission gears. On certain iron ore hauling trucks, the transmission gears were failing due to the tremendous stresses placed on them in carrying the heavy loads up and down a six-mile grade. Going up grade, the full power of the engine was directed against one side of the gear teeth; going down grade the braking action of the engine caused a direct reversal of stress against the teeth. The action of these stresses caused failure of the gears after two days' operation. Now by means of shot peening life of gears has been increased to several months. Peening is done in a Wheelapeening machine.

An airplane engine served as another example. Trouble experienced from cracking of aluminum alloy crankcases in certain corners was corrected by shot peening the affected areas. Later it was found that shot peening the entire crankcase increased their life 30 percent. As an overall result of shot peening, the rating of the motor was increased almost 50 percent without adding appreciable weight to strengthen the parts. The crankshaft, for example, was reduced five pounds in weight as the result of increased stress resistance.

In another case, trouble was encountered with a gear on which the teeth broke off at the roots. A test of similar gears showed a normal life of 111,000 cycles when subjected to a torque pressure of 1,200 ft.-lb. Another group of similar gears was shot peened with the result that the former limit of 111,000 cycles was raised almost 700 percent, or to 729,000 cycles. Then since failure still did not occur, the torque was increased to 1,550 ft.-lb. and the test resumed until failure finally occurred at 931,000 cycles.

Tests on a universal joint cross showed failure at 230,000 cycles at 1,200 ft.-lb. torque. After shot peening, this life was increased to the amazing figure of 2,000,00 cycles.

Shot peening is accomplished by

causing round chilled-iron shot to be thrown at a relatively high speed against the surface of the work to be treated. The throwing is done by a compressed air stream or by using bladed wheels to impart high velocity to the shot. Each shot acts as a tiny peen-hammer, stretching the surface of the metal in all directions as it hits.

There is a momentary rise in temperature of the surface due to transformation of energy. This heat may be enough to effect the plastic flow of the metal; however, the effect is known as cold-working, to distinguish it from metal flow at high temperature. The rain of shot causes a plastic flow of the surface fibers beyond their yield point in tension, in a layer that extends 0.005 to 0.010 in. below the surface. The fibers underneath this layer, however, are not stretched to their yield point and retain their elasticity. The under fibers are bonded to the stretched surface layer and after the peening action, the inner fibers force the outer fibers to return to a shorter length than that at which the stretched fibers would tend to remain. In the equilibrium which results, the surface fibers are in residual compression while the inner fibers are in tension. Experimental work indicates that the surface compression is several times greater than the tension stress in the interior of the section; so that when working stresses are applied that would ordinarily increase the tension stress on the surface, that tension is offset by the residual stress in the surface layer. Since it has been found that fatigue failures result from tension stresses, never from compressive stresses, the net result is considerably greater fatigue life.

Intensity of Peening Determined

A commercial method of controlling and measuring the intensity of shot peening has been worked out in the American Foundry Equipment Company laboratory, in connection with devices and methods developed by J. O. Almen of General Motors Company.

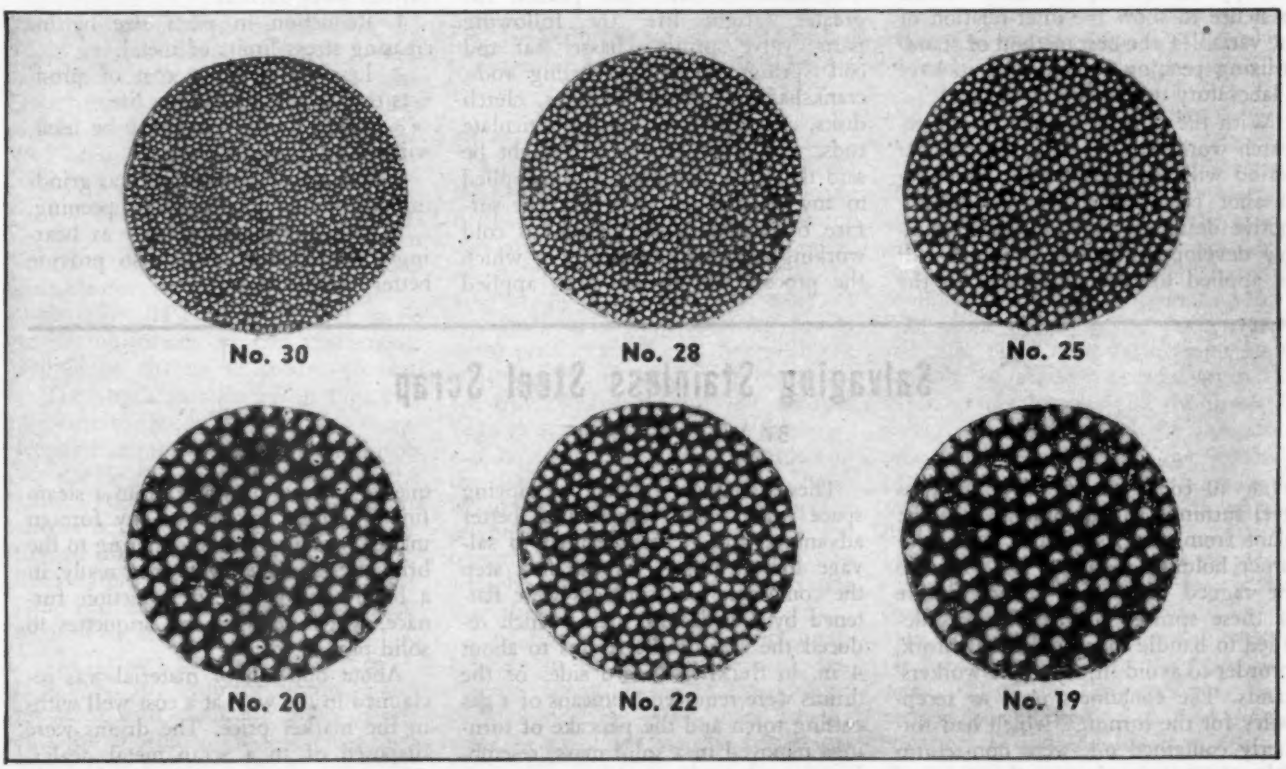
If a thin strip of hard steel is shot peened on one flat surface only, the stretching of the surface fibers causes the strip to assume a curved shape Taking advantage of the fact that the amount of curvature varies as the intensity of peening, Mr. Almen devised a gage to measure the arc height.

The original Almen gage consisted of a dial reading in thousandths of an inch, mounted on a block with the dial stem halfway between two knife edges. The dial was set to zero by a straight edge placed across the knife edges and the convexity of the test strip was measured by putting it across the knife edges. This gage has been supplanted by the No. 2 Almen gage, in which the two knife edges are replaced by four ball contacts, so that when the test strip is placed against the ball contacts, the dial registers a combination of arc both lengthways and sideways of the strip. This gage measures from the concave, smooth side of the test strip, to eliminate any variation due to peened surface roughness.

The use of small test strips enables the laboratory to simulate conditions on the piece to be shot peened, without using the actual part. For example, to determine the amount of peening to build up an arc of a predetermined height on the sides, web and fillet of an articulate rod of an aircraft engine, test strips can be placed on a simple fixture in relative position for shot peening. Tests then determine the length of exposure, size of shot and other factors to produce the desired arc height. Visual inspection determines the thoroughness of the peening. After the standards have been set, the rods themselves are peened.

Two thicknesses of Almen test strips are used. The *C* strip is almost twice as thick as the *A* strip, and is used on applications requiring high intensities with the larger shot, which would over-peen the thinner strip.

From the experimental work that has been done, and from commercial applications, a general rule can be set up to effect that any metallic material, the surface of which can be put into compression, will benefit from shot peening by having an increased fatigue strength.



Most shot used for shot peening is in the size range between No. 30 and No. 20. This illustration shows them twice actual size

The shot used in peening usually varies in size from No. 20 to No. 28. On springs, a comparison of the effect of using No. 30 shot (1/64 in. dia.) and No. 20 shot (3/64 in. dia.) showed very little difference in fatigue limit, although the difference in shot volume was 14.4 times. With the larger sizes of spring wire, results were a little better with the heavier shot.

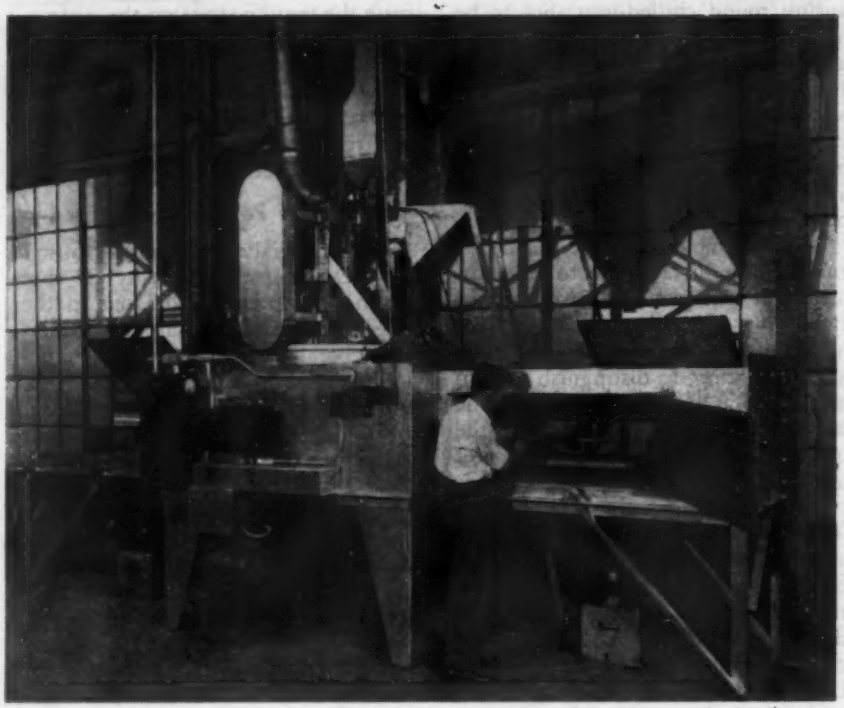
On parts such as crankshafts, gears, torsion bars and axle shafts the size of shot is determined by experience and checked by tests. As a general rule, it is best to use the smaller sizes of shot on parts with thin sections.

The following table shows variations in arc height, as determined by Almen test strips, with different sizes of shot:

Part	*Arc Height*	*Shot size*
Pinion gear	0.008 in.	No. 28
Pinion gear	0.012 in.	No. 25
Pinion gear	0.015 in.	No. 22

These tests were made on the same kind of gears, on the same machine, at the same speed. They show that all other things being equal, arc height varies directly with the size of shot. However, it must be remembered that besides size of shot, other things affect arc height, such as hardness of the metal being peened, length of time of peening, velocity of shot and location of hot spot (area of maximum intensity). Since no formulas are in existence to show the inter-relation of the variables, the best method of standardizing peening procedure is to have a laboratory test made of the part.

With the impetus gained by the research work already done, the postwar period will see considerable widening of shot peening applications. Automotive designers say that the technology developed for war products will be applied to civilian goods. In the future we may expect automobiles with more economical engines, with the same horsepower, because weight reduction will be possible by shot peening stressed parts.



This special machine can be used for shot peening a variety of parts. Size of shot and time in the machine are determined by previous tests

Already automotive and aviation manufacturers have shot peened for greater fatigue life, the following parts: valve springs, chassis leaf and coil springs, gears, connecting rods, crankshafts, steering knuckles, clutch disks, universal joint crosses, articulate rods, and many others. It might be said that shot peening may be applied to any metallic or other part, the surface of which is susceptible to cold working. Among the metals to which the process has already been applied are: steel spring wire, steel music wire, stainless steel wire, phosphor bronze wire, steel plate, alloy steels of all types, cast iron and aluminum.

Cost reduction of postwar products may be achieved by shot peening in various ways, such as:

1. Reduction in parts size by increasing stress limits of metal.
2. Less maintenance cost of products through better fatigue life.
3. Lower priced steel may be used, without affecting quality.
4. Certain operations, such as grinding may not be necessary with peening.
5. On sliding parts, such as bearings, shot peening may also provide better lubricating surfaces.

Salvaging Stainless Steel Scrap

BY W. O. DOWNS

OVER 40 containers of 18-8 stainless steel turnings had accumulated in the plant from a series of jobs, each container holding about 50 lbs. Due to the ragged edges and general nature of these springy shavings it was decided to handle them with a pitchfork, in order to avoid injury to the workers' hands. The containers used as receptacles for the turnings, which had formerly contained oil, were non-returnable sheet iron drums, the tops of which had been cut out, in order that chips might be deposited easily.

These containers were occupying space which could be used to better advantage and it was decided to salvage the turnings. As the first step the containers and contents were flattened by a hydraulic press, which reduced the size of the drums to about 4 in. in thickness. Two sides of the drums were removed by means of a gas cutting torch and the pancake of turnings removed in a solid mass, resembling an enlarged pancake.

These slabs were cut into strips about 14x5 in., in the form of briquettes. A jet of water from a steam line was used to remove any foreign matter which might be adhering to the briquettes and they were then ready, in a handy form, for an induction furnace, which reduced the briquettes to solid pigs of metal.

About one ton of material was reclaimed in the way, at a cost well within the market price. The drums were disposed of to a scrap metal dealer. The same procedure will undoubtedly be followed in the future if and when accumulations of this kind occur.

Difficult Contours Turned With Simple Attachments

BY CREIGHTON TAYLOR

Any toolroom can make a similar device to convert their engine lathes for turning molding dies of intricate, difficult shapes

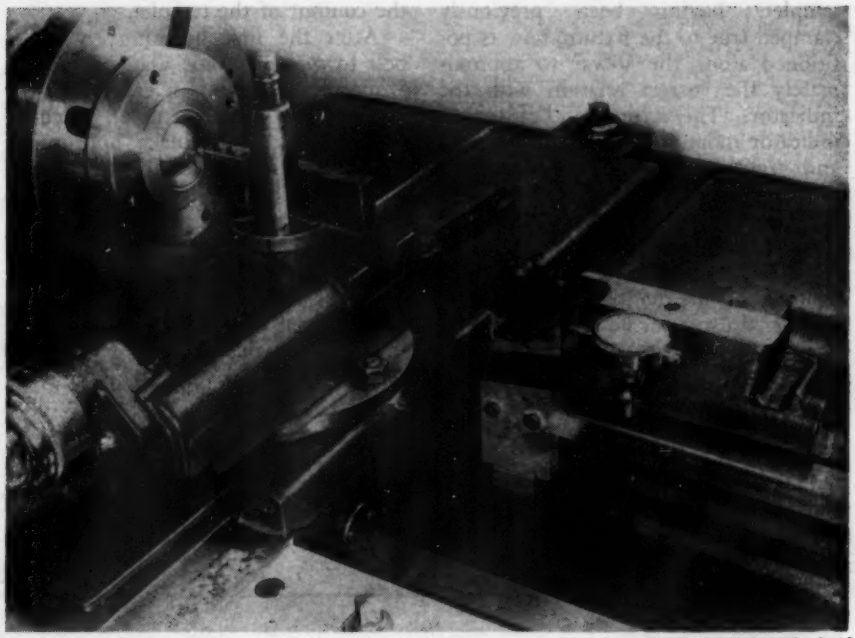


Photo by Andrew Akerlund

Fig. 1—With this set-up, contours in molding dies ranging from 3 to 12 in. in diameter have been finish turned and faced in a standard engine lathe

CONTOUR TURNING of intricate shapes for molding dies can be accomplished easily on standard toolroom engine lathes through the use of simple attachments, such as are shown in the accompanying illustrations. With such attachments, it is not necessary to make extensive changes in the lathe, and the attachments are easily removed to permit use of the machine for other operations. When set-up as shown in Fig. 1, these attachments have been used to finish-machine molding dies ranging from 3 in. to over 12 in. in diameter. In some instances the thickness of the finished product to be made in the dies was as little as 0.003 in., which indicates the accuracy of size and contour necessary for acceptable dies. Metal used for dies ranges from cast red brass for the larger sizes to stainless tool steel for smaller dies.

The attachments required are shown in Figs. 2 and 3. Dimensions shown in these sketches are for attachments suitable for a 16-in. Model CY Monarch lathe. If another lathe is to be used, dimensions of the attachments should be altered, of course, to suit.

The attachment shown in Fig. 2 is a fixture for holding the contour templet, and is arranged for mounting on the inside V-way at the rear of the lathe. The top surface of this fixture should be about 1¾ to 2 in. above the top of the cross-slide of the lathe. This fixture may be shifted along the lathe bed without changing the alignment of the templet with the work.

The largest part, shown in Fig. 3, is a steel bar, bent for clearance and provided with mounting holes in one end for attachment to the cross-slide and a hole and setscrew in the other end for mounting a dial indicator. The indicator stud shown is machined at one end to fit the dial indicator selected for the job, for some variance.

For each die, an accurate full-size templet of the desired contour is made of sheet metal. A smooth finish on the contour edge is, of course, desirable. In order that the templet may be aligned properly with the work, a straight edge is finished along one or more sides in correct relation with the contour line. In most cases the templet will require at least one straight edge to assist in layout, and this edge can be used to align the templet on the lathe. Over-size mounting holes in the templet allow shifting it for alignment, an indicator fixed in the mounting bar being used against the straight edge of the templet to test this alignment.

The indicator is fitted with interchangeable points and for each machining operation the included angle of the indicator point must be the same as that used on the bit in the toolholder. For the operation shown in Fig. 1, the included angle of the toolbit and indicator point is 45 deg.; this rather extreme sharpness being necessary to clear the sharp detail of the templet and work in this particular instance. For work of less severe contour change, it is best to use the greatest possible angle, up to an included angle of 90 deg., in order that the toolbit may approach optimum form. The point radius on the toolbit and indicator point must be the same, and must be of a size consistent with the detail of the templet and the finished work. The toolbit and the indicator are adjusted normal to the general plane of the templet and the work, and must be in accurate angular alignment.

A handwheel replaces the standard cross-slide crank handle for more steady and convenient operation and a split, knurled disk is fastened to the feed rod at the right of the lathe carriage. With the feed rod gear box disengaged and the carriage feed clutch engaged, the knurled disk is turned by the operator's right hand to move the carriage along the bed, while his left hand turns the cross-slide handwheel. Coordinate movements of these hand-

wheels while observing the indicator needle produces the required contour movement. In the case of a smooth, sweeping contour which does not reverse direction, the slowest feed may be engaged to either the cross-slide or the carriage while the other control is manipulated by hand. On the work illustrated, such a procedure could not be followed.

General procedure is to rough out the blank to practical limits and then change to the finishing toolbit. The templet, having been previously clamped true to the fixture, now is positioned along the V-way to approximately the correct relation with the indicator. The fixture, indicator and indicator mounting bar are positioned and tightened in place. Next, the cross-slide is moved until the indicator point is at some reference point, such as a center line or some particular diameter, corner or shoulder of the contour of the templet. The toolbit then is adjusted for height and angular position and the compound slide, which is set parallel to the cross-slide, is moved to bring the tool to a similar relationship with a like reference point on the work piece. The carriage then can be shifted to bring the toolbit at the starting point for the turning operation and the templet fixture reclamped so that the indicator is depressed a couple of thousandths. The dial is set to zero and the lathe is started. By staying on the minus side of the zero reading on the indicator while feeding the toolbit across the work, the surface irregularity produced will consist of peaks of metal to be removed by polishing and valleys whose lowest points represent the desired surface. Therefore, by polishing until the lines on the surface are just removed, the finished piece will be quite close to the contour of the templet.

After the first finishing cut, it is best to measure some diameter on the work piece. If it is in error with the correct size of the templet, calculate the difference and make appropriate changes in the compound slide setting to bring the tool and indicator into correct relation.

To make a female die from a male templet, reverse the templet so that the indicator faces in the opposite direction from the tool point. More care in manipulation must be used, for the total range of movement of the indicator stem limits the amount the toolbit may be removed from the work.

It is best to cut in the direction of travel which allows the indicator to follow the templet, rather than in the direction which would tend to make the templet drive the indicator. The latter condition creates a side thrust on the indicator stem, induces inaccuracies, and may even damage the indicator. In order to follow this advice, in some case, it will be necessary to cut with both sides of the toolbit. This means that zero top and side rake angles are required on the toolbit. However, by taking finishing cuts of 0.005 in. the work can be finished smoothly, even with such unfavorable lack of rake angles for steel. Liberal use of oil will keep the chips from building a false edge on the tool. The work illustrated presents the worst aspect for this method, namely a sharp-angled (45 deg.) tool that must cut on both sides, a stainless tool steel (17 percent chromium content) which is rather difficult to machine, small details to reproduce, and a required accuracy of a mirror-finished surface.

Some of the simpler curved shapes are remarkably easy to turn. When radii must be formed on ordinary lathe work, a radius gage can be clamped to the templet fixture and followed by a single-point tool rather than grinding a form tool which is quite likely to hog in and produce chatter marks, particularly when mounted on a boring tool holder and extended into a deep cavity.

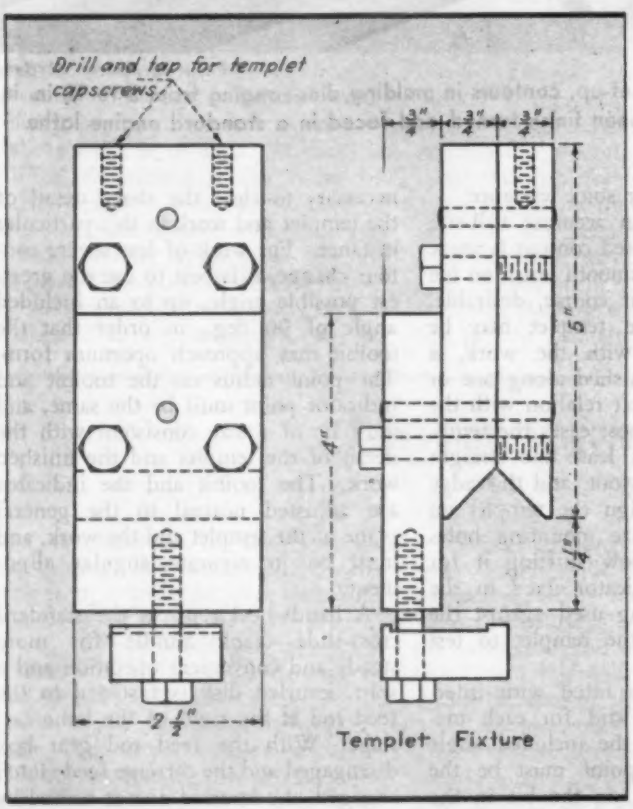


Fig. 2—This mild-steel fixture is mounted on the rear V-way of the engine lathe to position the contour templet as shown in Fig. 1

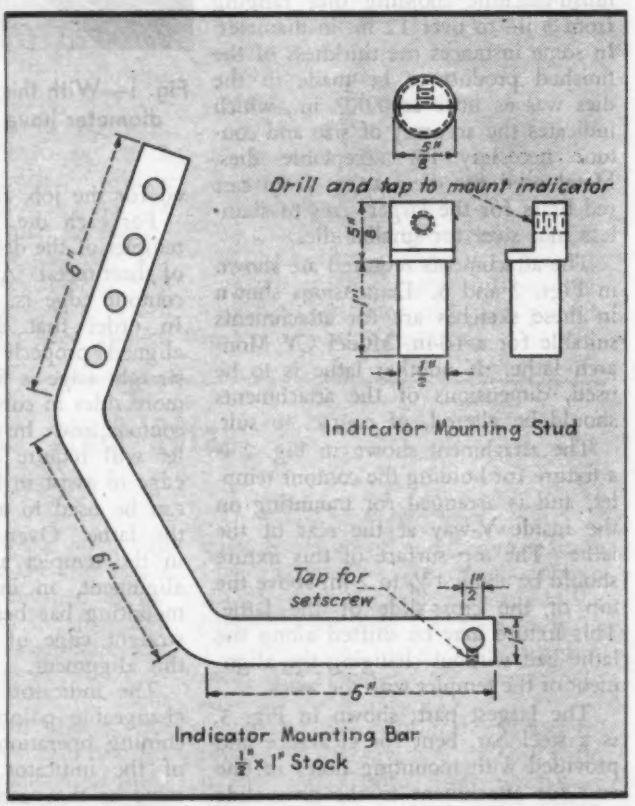


Fig. 3—A bar of steel bent for clearance and provided with mounting holes is used to support the dial indicator from the top of the cross-slide

Special Reamer Eliminates Honing and Polishing

BY CHARLES WOLFE, NORTH AMERICAN AVIATION, INC.

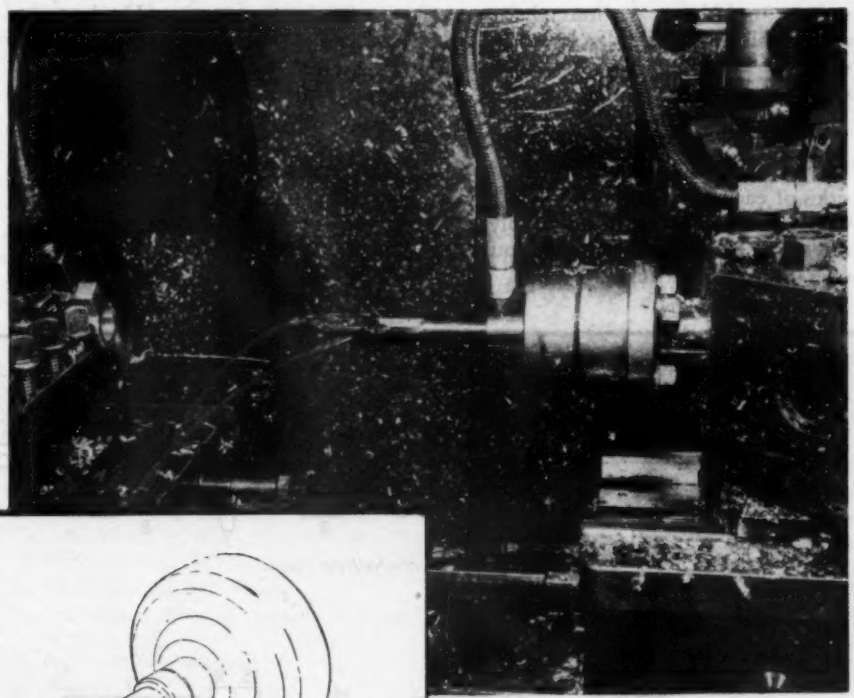
AT THE CALIFORNIA DIVISION of North American Aviation, it has been found that honing and polishing of the interior of dural hydraulic cylinders can be eliminated by reaming them with a special carbide-tipped reamer, which provides a finish of between three and five micro-inches. Formerly, honing required 8 to 10 min. per cylinder.

The reamer is used in a turret lathe, with a floating type tool holder. Speeds of from 740 r.p.m. to 1480 r.p.m. have been used. The reamer shown in the sketch is of a fixed type, 3 in. size, ground perfectly round, with no back-off. A reamer of this fixed type must be backed out of the hole at the same speed that it entered it. However, similar reamers have also been built in a collapsible type, which eliminates this backing-out requirement, and, also, gets away from the possibility of tool marks being caused by withdrawal of the tool.

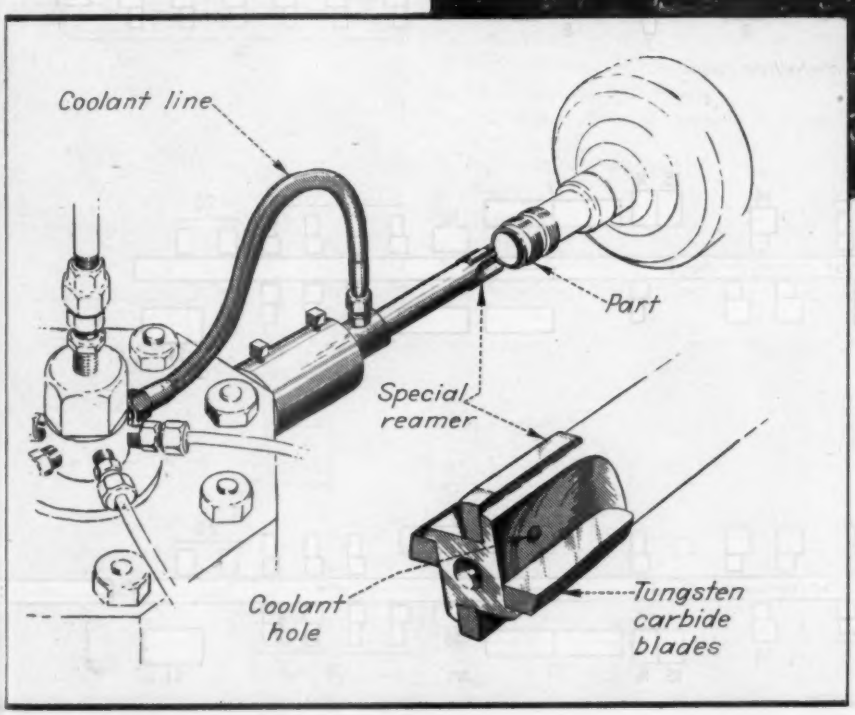
Between 0.002 in. and 0.012 in. is allowed for the reaming operation, and the tool will finish from 900 to 1,000 cylinders before it must be re-ground. In regrinding, only the lead is ground. The brazed carbide tips are set at a negative rake angle of 2 deg.

The coolant, a mixture of lard oil and kerosene, is passed through the hollow shank of the reamer, and is emitted to the work through small holes ahead of each of the flutes.

This tool has been found to give excellent results as a reamer, eliminating taper, etc., and finishes the inner diameter within the prescribed tolerance, 0.0015 in. readily, while the finish obtained is entirely comparable to that obtained by honing. Its use has sped production of hydraulic parts for fighter planes and is expected to have similar results as its use is extended to the finishing of other bored parts.



Carbide-tipped reamer in working position in the lathe, with coolant flowing from the four holes between the blades of the tool



Details of the reamer and the method of setting it up in a turret lathe

Conveyors Cut Machining Time On Cylinder-Head Assemblies

Chevrolet process engineers find that conveyors from former auto-engine assembly lines reduce the allotted times for machining and inspection operations on a P&W cylinder-head assembly engine

STANDARD TIMES for individual machining operations upon a Pratt & Whitney cylinder-head assembly have been cut from five to 20 percent by utilizing power-slat conveyors to transport the work from station to station. Originally these conveyors served as three parallel motor-assembly lines at the Motor & Axle Plant, Chevrolet Motor Division, General Motors Corporation, Buffalo. Now one conveyor moves cylinder-head assemblies through operations preceding metallizing, and the other two conveyors pass between subsequent machining stations that precede honing the cylinder barrel. The set-up is designed to process 105 assemblies per hour.

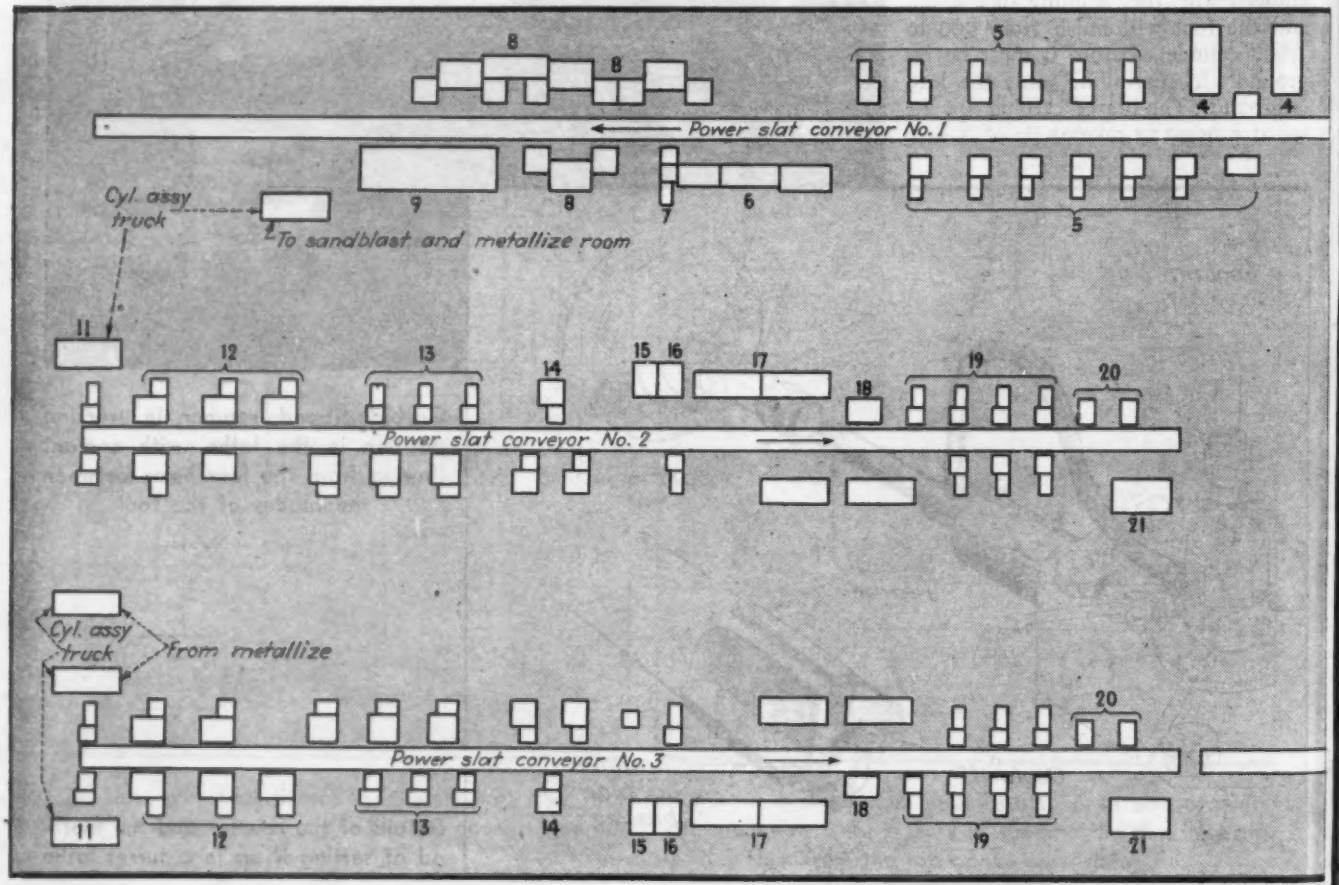
How Conveyors Function

Operations are performed on both sides of each conveyor. The individual worker picks every other assembly off the conveyor, performs the required operations at machine or bench, puts it back on the conveyor for transportation to the next station. He does not lose time in taking work from shop trucks and moving trucks from one point to another.

Other advantages accruing from conversion of the conveyors to their wartime task are: first, the department has twice the productive capacity of an equal area were shop trucks to be used, thus conserving floor space; and second, trucks, a difficult item to procure, were not required in large quantity. The only trucks used in the department are those for taking assemblies discharged by the first conveyor to the metallizing department and back again to the second and third conveyors.

The cylinder head and the cylinder barrel are of course the objects of considerable machining prior to assembly. The operations carried out after shrinking the head on the barrel are principally those required to position the assembly correctly on the power section and assure proper functioning of piston and valves. Steps on the first machining line are as follows:

At the first station, the cylinder-head assemblies are removed from the conveyor to benches for gas brazing the oil-scavenger line in place. Tightness of the rocker-arm bushings is checked at the second station, and they are driven home if necessary. The third station is reserved for inspecting the


Power slat conveyor No. 1
Cyl. assy truck
To sandblast and metallize room
Power slat conveyor No. 2
Cyl. assy truck
From metallize
Power slat conveyor No. 3

quality of brazing the oil-scavenger line and the assembly in general. No work can pass this point to enter machining operations without an inspection number etched upon the assembly.

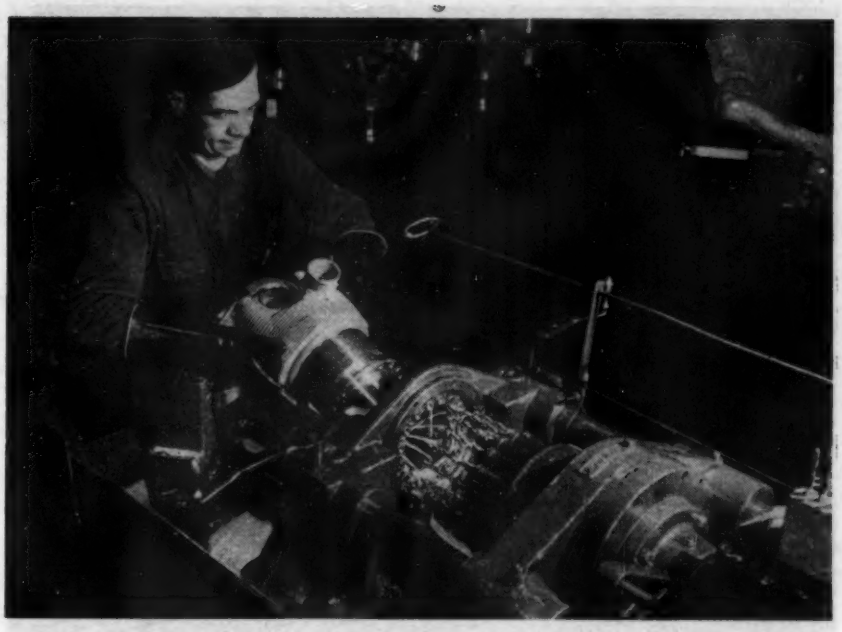
A battery of horizontal drilling machines, each equipped with a multiple-spindle head, is employed to drill the cylinder-stud bolt holes in the flange of the barrel. Location is taken from the valve-guide holes in the cylinder head to insure future alignment.

Battery of Spotfacers

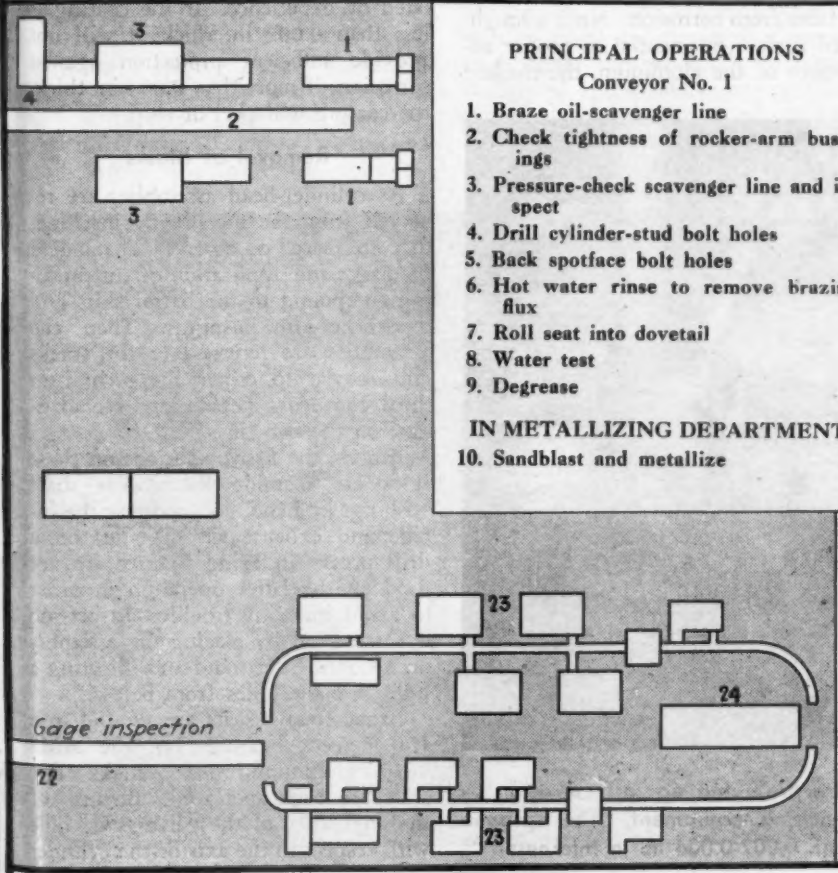
Each of the bolt holes in the flange must have a spherical nut seat, and this seat can be produced only by back spotfacing because of obstructions on the work. The back spotfacing operation is tedious because the cutter must be picked off the spindle, the machine indexed, the cutter replaced, and the feed engaged. Chevrolet process engineers have considered a hydraulically operated machine that will handle these functions automatically.

Brazing flux is removed from the work by dipping in hot water and then, at the seventh station, workers place assemblies upon "Continental" engine stands. These stands are a convenient accessory used in many engine plants for holding and rotating the piece as desired. While on the stand, the inner end of each valve-seat insert is rolled into a dovetail groove in the cylinder head. Soundness of the assembly under operating conditions is then determined by water testing at a pressure of 500-550 lb. per sq. in. An automatic blow-off on the conveyor removes water droplets from the cylinder-head assemblies before they are loaded into a solvent degreasing machine. This cleaning step concludes operations on the first conveyor line.

Degreased cylinder-head assemblies are placed on a special rack truck that has capacity for 30 workpieces. The



Sixteen stud holes are drilled in the flange of the cylinder barrel at each machine cycle. Work is delivered to the operator by the power slat conveyor in the background



PRINCIPAL OPERATIONS

Conveyor No. 1

1. Braze oil-scavenger line
2. Check tightness of rocker-arm bushings
3. Pressure-check scavenger line and inspect
4. Drill cylinder-stud bolt holes
5. Back spotface bolt holes
6. Hot water rinse to remove brazing flux
7. Roll seat into dovetail
8. Water test
9. Degrease

IN METALLIZING DEPARTMENT

10. Sandblast and metallize

Conveyor No. 2 or Conveyor No. 3

11. Ream rocker-shaft bushings
12. Ream intake and exhaust valve guides
13. Grind exhaust-valve seat
14. Spotface intake-valve seat
15 & 16. Drill and tap thermocouple hole
17. Tap spark plug hole
18. Blow off
19. Insert pushrod gland and various studs
20. Water test
21. Degrease and rustproof

REMAINING OPERATIONS

22. Gage inspection
23. Hone the cylinder barrel
24. Degrease
25. Final visual inspection

★

Timed production and more orderly shop conditions are obtained from a layout in which operators are merely required to pick cylinder-head assemblies from conveyors 1, 2 or 3 to perform the required tasks at machine or bench

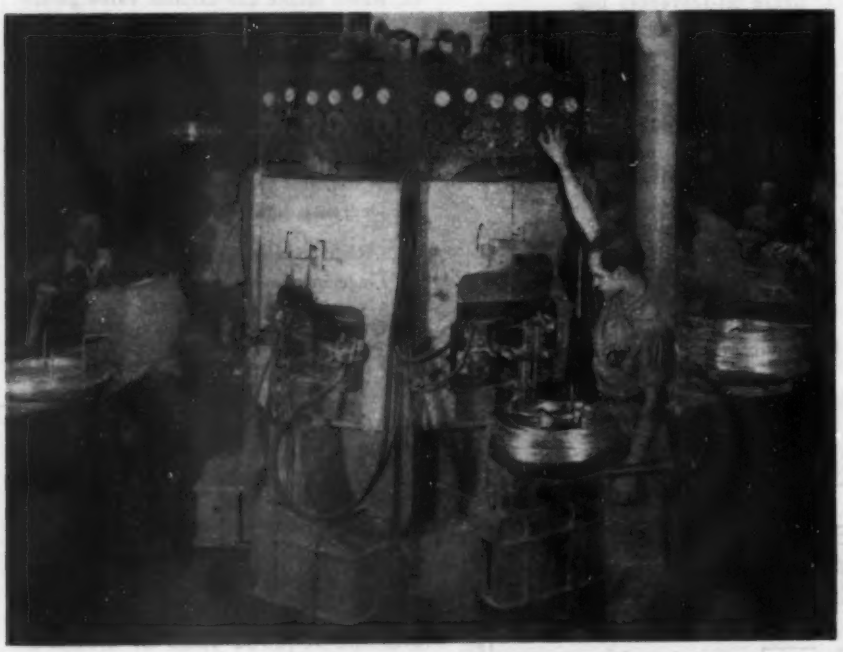
★

Cylinder-head assemblies are degreased in an automatic machine after the water test. The workman at left removes an assembly from conveyor No. 1 behind the degreaser and hangs it on the degreaser conveyor. The workman at right loads clean assemblies on the racks for transport to metallizing

rack is A-shaped. Three cross-members are fastened on each side. To these are bolted wood plugs that fit loosely in the cylinder barrel, providing support but permitting the assembly to be turned as needed when applying masks prior to sandblasting. Thus, the special truck serves a double purpose: (1) to transport pieces safely, and (2) to avoid a second handling during the masking procedure.

Metallizing—or metal-spraying a coat of aluminum from 0.002-0.004 in. thick—is required on the body of the cylinder barrel to protect exposed steel surfaces from corrosion. Since a roughened surface is essential to proper adherence of the aluminum, the masked assemblies are sandblasted on a rotary-table machine mounting twelve fixtures. One station is used for loading and unloading, another for hand touch-up if required. The remaining ten stations are equipped with 3/8 in. nozzles —a total of 25 located at various angles—so that all surfaces to be metallized are properly roughened in one 40-sec. cycle through the machine.

Sandblasted assemblies are removed to a table, where rubber plugs are inserted in the 16 bolt holes in the flange. These holes must be sandblasted but not metallized.



Exposed portions of the cylinder barrel are protected against corrosion by processing on six-station automatic metallizing equipment. The sprayed aluminum coating is controlled between 0.002-0.004 in. in thickness

Coating Thickness

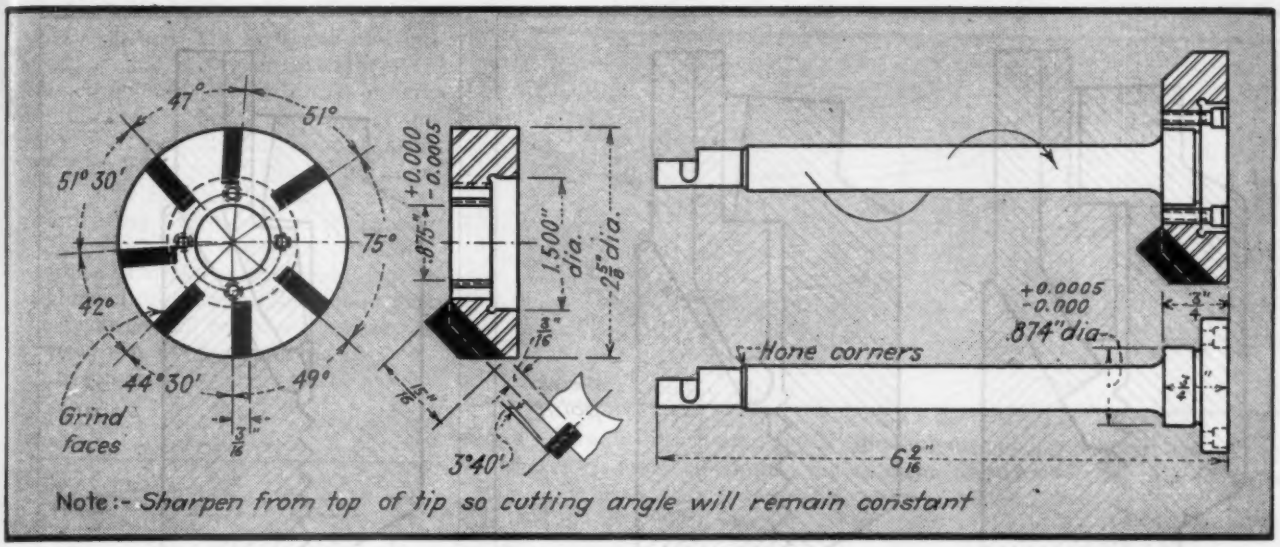
Metallizing machines are approximately 6 ft. in diameter, have a rotating table mounting six fixtures. One station is used for loading and unloading, another is employed to hand spray the oil-scavenger line. Three stations are fitted with guns that automatically follow the work and spray specific surfaces for timed intervals. No. 11 gage aluminum wire is fed automatically into the four guns dispersed among these three stations. Wire is consumed at the rate of 4 1/4 to 4 3/4 ft. per min. Oxygen is supplied to the guns at a pressure of 28 to 33 lb. per sq. in.; natural gas at a pressure of 26 to 30 lb. per sq. in. The machine is adjusted to produce a complete assembly every 40 sec. Control standards for coating thickness are dictated by experience. If the coating is less than 0.002 in. thick, it will not provide sufficient protection against corrosion; if more than 0.004 in. thick, the coating will peel or chip.

Removal of Masks

As cylinder-head assemblies are removed from the metallizing machine, they are placed on a bench for removal of masks and application of rustproofing compound to the barrel skirt and the rocker-arm bushings. Then, the assemblies are returned to the trucks and moved to either the second or third conveyors (operations are identical on the two lines).

Among the first operations on these lines are reaming the rocker shaft bushings by hand, and reaming the intake and exhaust valve guides on a drill press. Indexing fixtures are not used on the latter operation in order to avoid indexing troubles. Inspection is carried out by placing the assembly on a Continental stand and directing a light into the holes from below.

Exhaust-valve seats are ground to a 100 percent bearing, but the AMS 4630 aluminum-bronze intake-valve seats are back spotfaced. Because of the angularity of the valve-guide hole with respect to the axis of the cylinder



Two-part construction is employed for the back spotfacer that machines the intake-valve seat; the cutter body which has seven carbide blades located at the angles shown, and the shank which has a ground 0.874 in. diameter to locate the cutter body

assembly, it is necessary to drive the tool at 32 r.p.m. through a universal-joint connection. A spotfacer with seven carbide blades has been developed for this operation. The blades are ground with zero radial rake and a 3 deg. 40 min. clearance to produce smooth finish and the 100 percent bearing required. Production gain with this tool amounts to 65 percent and tool maintenance is easier than was the case with previous designs.

Conveyorized Inspection

When cylinder-head assemblies reach gage inspection they pass down a "conveyorized" line that save several handlings. Company inspection and Army inspection are done on the one line for convenience. A 50-ft. bench is fitted with two tracks upon which work pallets can be pushed from station to station. Since the cylinder-head assembly is fastened to the pallet with thumbscrews, the work can be safely tilted if necessary when making a specific inspection. Workers are placed on both sides of the bench. When pallets reach the end of the line, the cylinder-head assemblies are unfastened and transferred to the barrel-honing line. Pallets are returned to the starting point by means of a gravity track under the bench. After barrels are honed and visually inspected, the cylinder-head assembly is placed on a rack truck according to pattern number for transfer to the assembly plant.

By using a fixture that tilts the barrel, the worker can readily see the quality of seat produced by the back spotfacer

Cylinder-head assemblies are inspected by a conveyorized set-up that saves much handling. "Roller-skate dollies, or pallets, move along two tracks while company inspectors make various checks. The two lines converge at the right where the government inspectors work

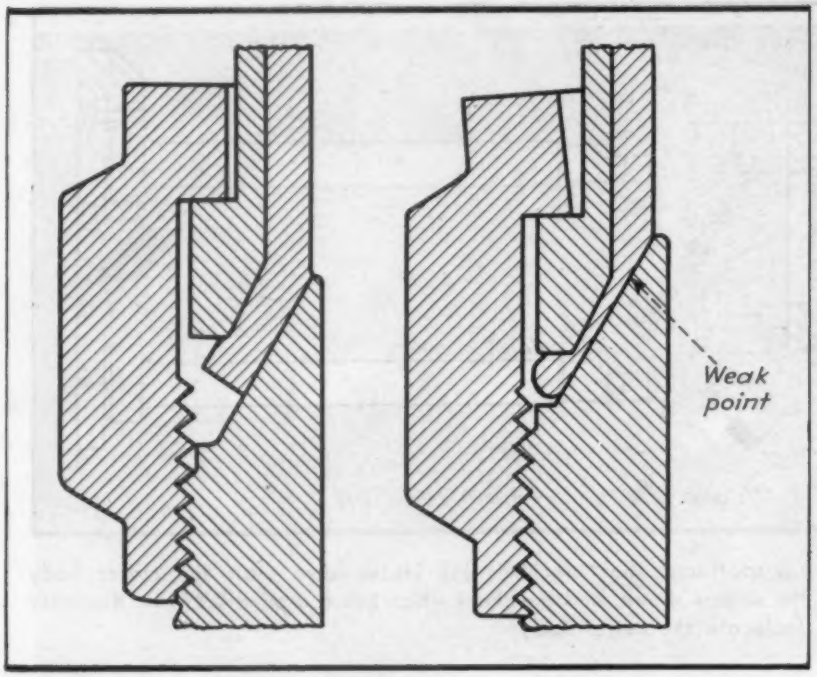


Fig. 1—Hydraulic fitting, type AAF811, properly tightened, contrasted with the same fitting overtightened

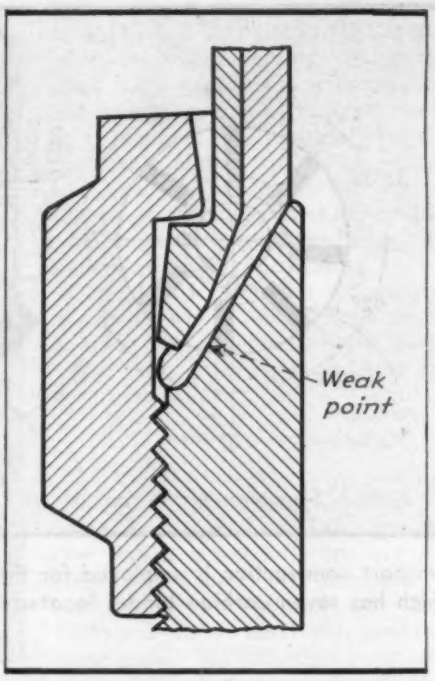


Fig. 2—Showing effect of overtightening on a fitting of the AN type

Torque Wrenches Aid in Precision Assembly of Tubing

BY JOHN CURLETT, PRODUCTION ENGINEER, DOUGLAS AIRCRAFT COMPANY

Standard torque loads have been applied to virtually all threaded connections in Douglas airplanes and torque wrenches are being used, one exclusively for tubing

BETTER METHODS of handling critical assembly operations have greatly reduced complaints and reworks at the Santa Monica plant of the Douglas Aircraft Company. For example, we have held training courses in which employees without previous mechanical experience have been taught the importance of precise assembly, and, of course, service experience with our airplanes is constantly being analyzed by our engineering department to establish new standards and methods for our assembly operations. However, we think that the use of torque wrenches has been the largest single factor in our improvement.

And that improvement has been remarkable. At one time, we had an average of one hundred "leaks" a day on fluid lines; that is, that many loose or damaged tubing joints that had to be tightened or replaced after the assembly operation had been made. In proportion to the many hundreds of such joints contained in the total daily output of our factory, its reduction to the present level, six a day, makes an imporant saving in labor and material. Similarly, defects in the initial assembly operation on structural parts, engine parts and mounts, and landing gear parts, which formerly averaged two a day, are now practically unknown. Provision of means for proper, uniform torquing has done it.

Standard torque loads have been determined and are applied to virtually all threaded connections in our A-20 (Havoc) bomber and our C-54 (Skymaster) cargo carrier, including the pre-loading of bolts that join parts of the airframe or support equipment, the seating of spark plugs, tightening of hose clamps, and, particularly, the joining and clamping of tubing lines.

A great deal of tubing, with hundreds of joints, is used in an airplane. Our C-54 model, for example, requires more than 500 lb. of aluminum tubing alone. Copper tubing is used for the oxygen system; stainless steel, for the high-pressure hydraulic lines, and aluminum, either soft or semi-soft, for other fluid lines. Lines of semi-soft, 52SO, aluminum alloy make up the greater part of the network that might be called the veins and arteries of an airplane.

Before a length of tubing arrives at the point where it is to be assembled, it has been cleaned, formed, cut to length, equipped with compression nuts and flared. It has been pressure-tested and examined for nicks, cuts,

and scratches. The final and most important step is proper assembly. An undertightened joint will leak, or may, with certain fittings, blow out at the sleeve. Overtightening may damage or cut off the flared end of the tube. The latter fault is the more common, particularly with tubing of the smaller sizes which can withstand much less torque. On the other hand, if it is tightened properly, a tubing joint may be removed and retorqued as many as twenty times before reflaring.

For the instruction of employees who handle tubing, our training department has prepared a pamphlet which covers the subject in detail, and which includes diagrams that compare typical fittings, properly torqued, with the same fittings overtightened, as shown in Figs. 1 and 2. It has been found, however, that the "feel" of even the most experienced mechanic is not as satisfactory as a definite torque loading value. Torques that are used for the assembly of various sizes and kinds of tubing are shown in Tables I and II. Minimum and maximum values are shown in these tables, but it has been found most satisfactory to work to a single recommended figure between the given limits.

Several types of torque wrenches are used. The type that is used for tubing is one in which the imposition of the rated torque causes the release of a small "clicker" button against the operator's hand, thus giving a "hear and feel" warning that the load limit has been reached. This type of wrench is useful when the work is in an overhead or hard-to-see location or, as is the case with tubing, where the operation is repeated frequently. Wrenches of the dial type, of several styles, are used for operations in which varying torques are applied with one wrench, or where the operation is repeated less frequently.

The amount of torque necessary to release the "clicker," for an individual wrench of that type, can be adjusted

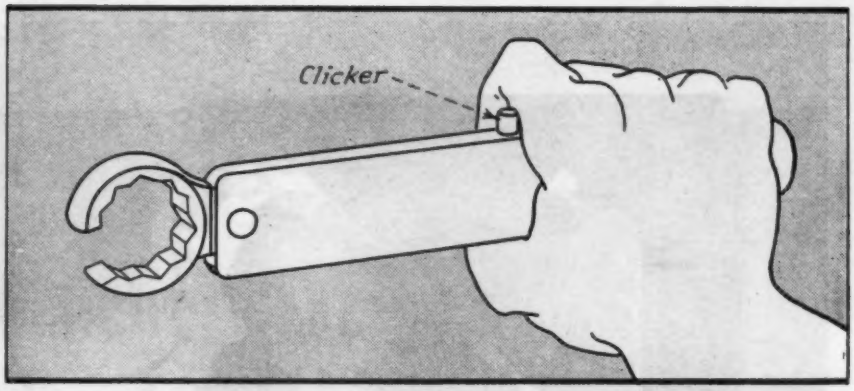


Fig. 3—Torque wrench used by Douglas for assembling joints of tubing lines. A "clicker" is released against the operator's hand when the desired torque value has been reached

TABLE I

Wrench Size	Tubing Dia. In.	Min. Torque In.-Lb.	Rec. Torque In.-Lb.	Max. Torque In.-Lb.
3/8	1/8	10.	12.5	16.
7/16	3/16	20.	28.2	40.
9/16	1/4	40.	50.	65.
5/8	5/16	60.	78.	80.
11/16	3/8	75.	112.	125.
3/4	7/16	115.	153.	192.
7/8	1/2	150.	200.	250.
15/16	9/16	191.	253.	316.
1	5/8	200.	312.	350.
1 3/16	3/4	300.	450.	500.
1 3/8	7/8	394.	525.	655.
1 1/2	1	500.	600.	750.
1 11/16	1 1/8	505.	675.	860.
1 15/16	1 1/4	562.	750.	940.
2 1/4	1 1/2	675.	900.	1120.
2 5/8	1 3/4	788.	1050.	1310.
2 15/16	2	900.	1200.	1500.

52 SO aluminum alloy lines "BT" nut torque loads in inch-pounds, for tightening AAF 811 and Parker tube fittings using aluminum alloy "BT" nuts and standard AAF 811 dural or copper silicon sleeves; also for AN standard fittings. These torque loads do not apply when other materials or combinations of materials are used

TABLE II

Wrench Size	Tubing Dia. In.	Min. Torque In.-Lb.	Rec. Torque In.-Lb.	Max. Torque In.-Lb.
7/16	3/16	60	80	100
9/16	1/4	100	125	150
5/8	5/16	150	175	200
11/16	3/8	200	225	250
7/8	1/2	325	362.5	400
1	5/8	475	525	575
1 3/16	3/4	650	712.5	775

Steel lines "BT" nut torque loads in inch-pounds, for use where the nut, line and fitting are all steel and the sleeve is steel (or copper silicon or aluminum bronze in sizes 1/2 in. or above only) will the torque for steel be used, aluminum alloy torque to be used in all other cases

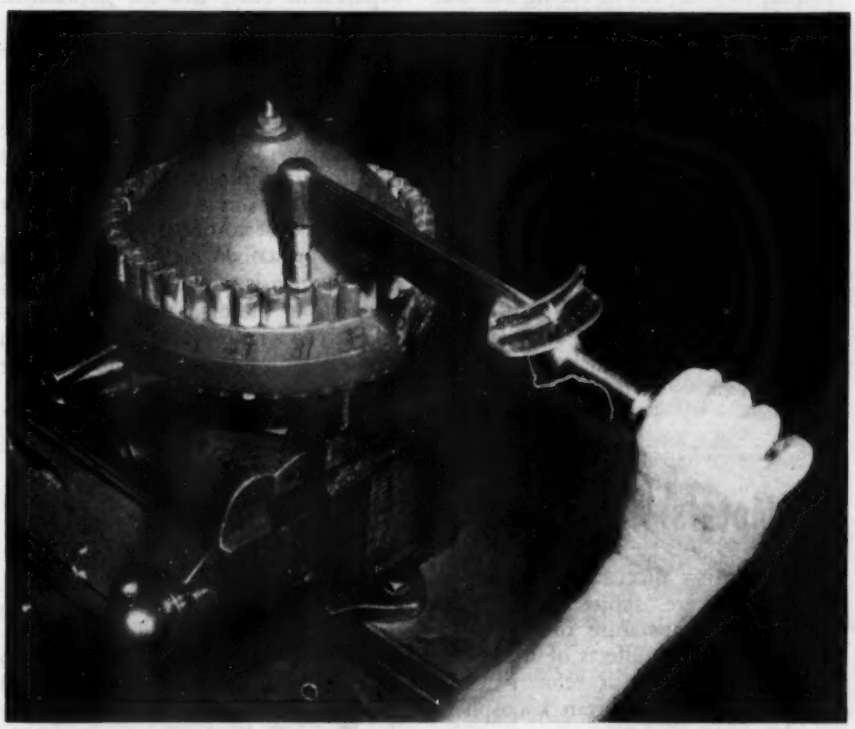


Fig. 4—A torque wrench in use at Douglas, in the assembly of a pressure accumulator, a part of the hydraulic system of a Douglas airplane

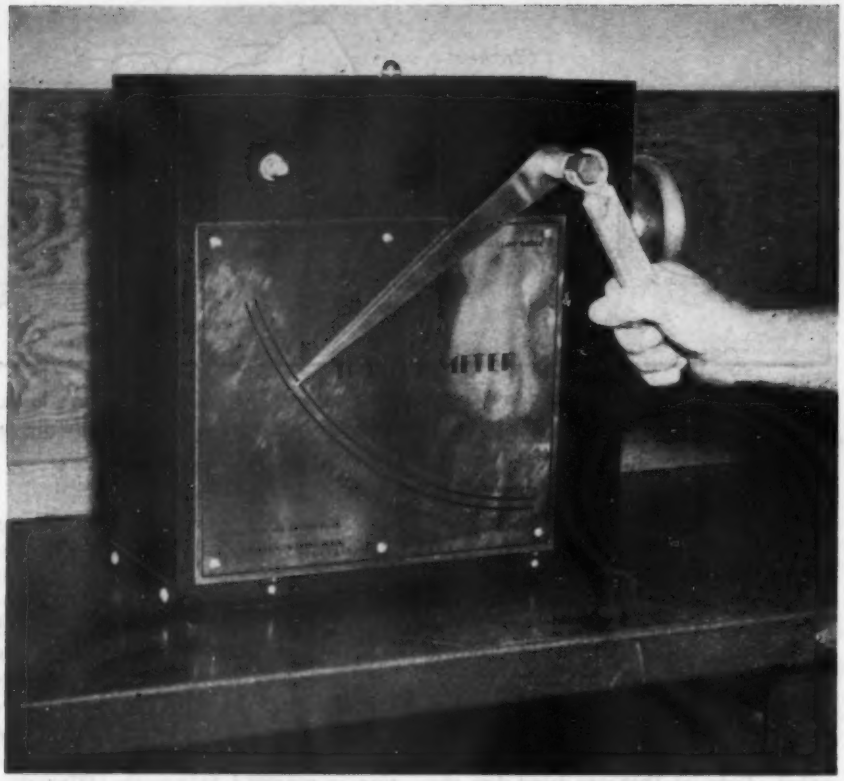


Fig. 5—Checking the torque setting of a wrench of the type used by Douglas for assembling fluid lines

but workers are not permitted to make that adjustment. Instead, wrenches that have been pre-set to the proper torque are furnished at each working station, for each size of tubing nut that is to be tightened. Wrenches for use on steel tubing are finished in black, to distinguish them from those which have been set for the torque values used for aluminum and other soft-metal lines.

Of course, an inaccurate torque wrench is worse than none. To insure accuracy, our plant tool inspection department checks torque wrenches at intervals of about two weeks. A card record is maintained, on which the location, torque setting, and date of inspection of each wrench is noted. A scale balance is used to check the accuracy of dials, and the correctness of the setting of wrenches of the "clicker" type. Adjustment of the torque values of this latter type is made by the tool department only, and the adjustment screw is sealed after the setting is made so that it cannot be altered by the employee using the tool.

With accurate wrenches provided, the only other problem is that of being certain that they are used properly. In our training program we have impressed upon our employees the great importance of torquing assemblies exactly as prescribed, pointing out that a defect which is not discovered may be, literally, a life-or-death matter. Excellent cooperation has been had from workers and supervisors and a better product at lower cost has resulted.

Metals Which Stand Heat and Humidity Best

FOUR GROUPS of 18 selected metal specimens were subjected to combined high temperature and high humidity to test the effects of the corrosive atmosphere in a refinery along the Gulf Coast. Such an atmosphere attacks various metals very actively. The tests covered two groups of metals located indoors and two out of doors for a period of 18 months.

Various metals when subjected to the combination of high temperatures, high saline humidity, and to the gases which are found around and in the various oil refineries along the Texas Gulf Coast exhibit a high rate of corrosion. This condition has been the cause of much destruction to inclosing cases, structural members, and to electrical parts which are magnetic. This gas also rapidly attacks current carrying parts such as copper, cadmium, silver and other materials.

The tests led to these conclusions:

1. Of the four electro-plated coatings on copper, the tin appeared to stand up best. The cadmium was completely gone and the silver showed heavy attack as evidenced by the scaly black deposit which was probably silver sulphide. The lead plating did not look so bad on the surface but on closer inspection, deep pits of the copper base metal were noted.

2. Rating the chromium alloys in their order of merit, 18-8 stainless steel and Nichrome V average up about the same and rate about the best in this test. The 25 percent chrome steel was somewhat worse and the 12 percent chrome steel was decidedly inferior to the three others.

3. While aluminum, untreated, showed a uniform corrosion coating and the anodized aluminum had scattered pits, this metal showed up nearly as well as the 18-8 stainless steel. Considering price, it was the consensus of opinion that aluminum, anodized or otherwise properly treated for paint, and then given two or more coats of suitable aluminum paint, would provide one of the most corrosion-resistant combinations.

4. The test on copper and copper alloys showed conclusively that the high copper metals have a low resistance to corrosion in this kind of atmosphere and should not be used unless protected by some protecting coating.

5. A comparison of monel and nickel indicate that nickel was not attacked as much as was monel.

6. The extremely bad corrosion of the unprotected cold-rolled steel indicates the severity of the corrosive atmosphere at this location and emphasizes the necessity for maintenance painting on any steel parts.

7. Lead showed up outstandingly well but because of its low physical properties would not lend itself to many applications.

8. The interesting observation on silver was that although it was heavily attacked there was no sign of pitting or noticeable etching. The metal underneath the corrosion film was very smooth. On large knife switches the silver surfaces continued to carry their currents satisfactorily.

Abstracted from a paper by W. L. Maucher and B. W. Jones, General Electric Company, presented before the semi-annual meeting of the American Society of Mechanical Engineers.

Milling Cutters and How to Use Them

Heat-Treatment Develops Best Cutting Properties

BY M. MARTELLOTTI, RESEARCH ENGINEER, CINCINNATI MILLING MACHINE CO.

2—Understanding of the various methods of heat-treatment and what goes on inside the metal during the process is of help in securing optimum performance

THE PURPOSE of heat-treatment is to impart to tool steel definite physical properties such as hardness, resistance to abrasion and a certain degree of toughness. Cutting materials such as Stellite and the sintered carbides do not require heat-treatment after fabrication.

In general terms, heat-treatment consists of heating a piece of steel from room temperature to a high temperature, and then cooling it back to room temperature at a predetermined rate.

A number of elements, including iron, carbon, tungsten and molybdenum, are used in the fabrication of tool steels. Some of these elements combine chemically at high temperatures, and after cooling to room temperature are found as innumerable minute grains or crystallites, dispersed in a matrix of pure iron known in metallography as ferrite (Fig. 3).

On cooling a steel part or tool from the liquid state to room temperature, several transformations take place in its structure. These transformations are characterized by the fact that within certain ranges of temperature, the drop in temperature of the specimen will stop, to be resumed again after completing the transformations. These are called critical points on cooling.

Also on heating the part or tool, there will be a momentary stop in temperature rise at approximately the same points. These are called critical points on heating. The difference in temperature between critical points of cooling and heating is very small, and in practice no distinction is made between them. They are simply called critical points. The transformations occurring at the high temperature are the starting points in making a tool steel suitable as a cutting material.

In heat-treating tool steels, a series of operations known as normalizing, annealing, heating for stress relief, hardening and tempering are performed. These operations and terms used in referring to them may be defined as follows:

NORMALIZING involves heating a steel to a temperature above the critical range until uniformly heated throughout, and then cooling in air. Normalizing is performed to produce a rearrangement in the structure of the steel so that it has a more uniform distribution of grain size, and also as a corrective treatment to bring the structure of the steel back to normal conditions after forging or to put it in condition for rehardening.

ANNEALING consists of heating steel to a point above the critical range and then allowing it to cool very slowly. It is done for the purpose of removing forging strains, to make the steel softer for machining, or to produce a different structure in it.

Annealing a carbon tool steel may affect the properties of the steel resulting from the hardening. Tool steel should be held at the annealing temperature for a sufficient length of time to permit thorough penetration of the heat, and spheroidizing if necessary.

The cooling which follows should be very slow to a temperature of 1000 F., after which more rapid cooling can be used. For annealing operations, carbon tool steels are packed in lime or a mixture of sand and charcoal to prevent scaling.

STRESS RELIEF. During the manufacture of cutting tools, stresses are produced by machining. These can be removed before hardening by heating the tool to a point below the lower critical point between 1275 and 1325 F., and then allowing it to cool in the furnace or in the air.

In *HARDENING,* the tool is heated to a temperature above the upper critical point and then cooled rapidly to impart the required hardness. The heating is performed in a furnace or a salt bath.

QUENCHING consists of cooling heated steel by submerging it in water, oil or sometimes brine, a solution made of 5 to 10 percent sodium hydroxide and water. Some steels are oil hardened while others, including high-speed steels, can be hardened by cooling in air.

TEMPERING or "drawing" is performed at a relatively low temperature. It consists of re-heating a tool that has been hardened, in order to relieve the stresses produced in quenching it and to increase its toughness.

DECARBURIZATION refers to the removal of carbon from the surface of steel by the action of elements which react with carbon (normally oxidizing).

ATMOSPHERE, in heat-treating practice, refers to the atmosphere obtaining around the tool while it is being heated in the furnace. There are three general types of atmosphere—

oxidizing, neutralizing and reducing.

Furnaces providing regulation of the atmosphere are known as atmosphere-controlled furnaces. To obtain atmosphere control, gases are introduced into the furnace in kinds and percentages which determine the desired effect. An oxidizing atmosphere is obtained by circulating more air than is required in the furnace for proper combustion of the fuel. It produces scale and decarburization of the steel. A neutral atmosphere is obtained by supplying an amount of air sufficient for complete combustion of the fuel but no excess. A reducing atmosphere is obtained by admitting less air than is required for proper combustion of the fuel. This is also known as a "carburizing atmosphere," since it results in the addition of carbon to the surface of the steel.

Procedure for Heat-Treatment

The heat-treatment of tool steels should be made in accordance with instructions received from the manufacturer of the steel. As a general guide, the procedure is as follows:

1. Carbon Tool Steels

(a) Plain carbon tool steels are normalized, hardened and annealed at a temperature which, in general, depends upon the percentage of carbon found in the composition of the steel.

For steels having 0.95 to 1.10 per cent carbon, the normalizing temperature varies between 1550 and 1700 F., and the annealing temperature between 1400 and 1440 F. The hardening temperature varies between 1400 and 1475 F. From this temperature, tools are quenched in brine or water, and are tempered to a temperature of 300 to 375 F.

(b) Alloy carbon tool steels are subjected to the same heat-treating procedure as used for plain carbon tool steel of comparable carbon content, with the exception of the low tungsten and tungsten-chromium-vanadium tool steels, which require higher annealing and hardening temperatures. The tempering temperature is approximately the same in both plain and alloy carbon tool steels.

2. Alloy Tool Steel

(a) Tungsten high-speed steels of the 18-4-1, 18-4-2 and 14-4-2 types can be heat-treated in any type of furnace and in practically any kind of atmosphere without giving trouble from decarburization. To obtain a surface free from scale, however, an atmosphere containing from 6 to 12 percent of carbon monoxide is preferable.

Annealing the 18-4-1, 18-4-2 and 14-4-2 types of tungsten high-speed steel is performed by heating slowly and uniformly to a temperature of 1600-1650 F., then cooling in the furnace until below 1000 F. Machining stresses can be removed before hardening by annealing at 1250-1350 F.

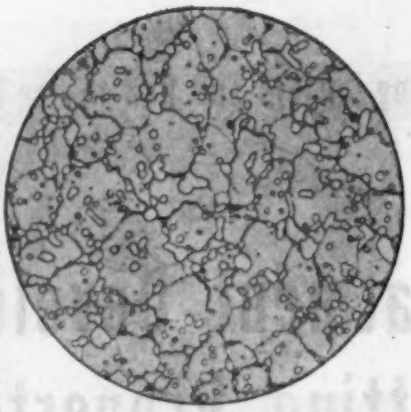


Fig.-3—An 18-4-1 high-speed steel has the structure shown in this photomicrograph when correctly hardened (Courtesy J. P. Gill, Vanadium Alloys Steel Company)

In heat-treating for the purpose of hardening, high-speed steel is preheated slowly and uniformly to a temperature of 1450-1600 F. The tool is then transferred quickly to another furnace which is maintained at a temperature of 2250-2350 F. for 18-4-1 steel, 2300-2350 F. for 18-4-2 steel and 2200-2300 F. for 14-4-2 steel. This is followed by quenching in oil, air or molten bath.

Quenching is usually done in oil to a temperature of 1100 F., after which the tool is allowed to cool in air to a temperature varying between 200 and 300 F. This is followed by tempering to a temperature of 1000-1150 F. From this point the tool is cooled in air to room temperature.

(b) Molybdenum high-speed steels decarburize more readily than the tungsten types, and precautions must be taken in order to obtain the proper results.

The 66 type (tungsten-molybdenum high-speed steel) is similar in characteristics to 18-4-1. Satisfactory heat-treatment can be obtained in the same type of equipment as used for 18-4-1. Hardening this grade of molybdenum steel is performed by pre-heating between 1250-1550 F., followed by heating to the hardening temperature of 2175-2275 F. and quenching in an oil or molten bath to approximately 1100 F. After cooling to room temperature, it is immediately tempered by re-heating slowly and uniformly to the tempering temperature of 950-1100 F. A slightly oxidizing type of atmosphere is preferred when no protective coatings are employed.

The 92 type (molybdenum-tungsten high-speed steel) and the 90 type (molybdenum-vanadium high-speed steel) are pre-heated to 1250-1500 F., hardened to 2150-2250 F. and tempered to 950-1100 F. They are annealed at 1450-1550 F. and stress-relieved at 1150-1350 F.

Since these grades are more sensitive to decarburization, they require special protective coatings such as borax. This can be done by sprinkling the coating material lightly over the steel when it has been heated to a low temperature between 1200 and 1400 F. Another method applicable to finished tools is to apply borax or boric acid in saturated water solution maintained between 180 to 212 F. As in the case of tungsten high-speed steels, better results may be obtained by heating in a salt bath.

(c) Cobalt high-speed steels are preheated to a temperature of 1500-1600 F. an dthen transferred to a high temperature furnace at a temperature between 2325 and 2375 F. After the part has reached this temperature, it is quenched in still air, air blast or oil until cooled to a temperature of 100-300 F. Following this, it is tempered immediately to a temperature of 1000-1150 F. In some cases, a second tempering to 600-650 F. is used to toughen the steel without materially affecting its hardness.

Cobalt high-speed steels are subject to decarburization, and grinding of all the working surfaces is necessary to remove the soft skin which is the product of decarburization, unless hardened in a controlled atmosphere or a salt bath.

Other Ways to Improve Tools

High-speed steel cutting tools are also treated by other processes which have been found to improve the cutting performance and to increase tool life between grinds. Two of the most widely used methods are salt bath hardening and chromium plating, which are particularly effective in increasing the life of milling cutters operating on non-metallic material and non-ferrous metals. These processes improve the resistance of the material to abrasion by increasing the hardness of the outer working surfaces of a cutting tool.

A third method is low temperature treatment in the range of –80 to –150 F., used either in conjunction with the regular heat-treatment or on the finished tool in the shop. In many cases this treatment has been found to increase cutter life between grinds, obtain a more uniform distribution of hardness, and produce a slightly greater

hardness than is possible with the regular methods of heat-treatment.

This method of treatment may be used on high-speed steel milling cutters of the tungsten, molybdenum and cobalt types. It may be applied in conjunction with the heat-treatment usually performed during manufacture of the cutters, and it has also been found to be effective on milling cutters taken out of the tool crib in the shop and which have had no previous cold treatment.

In the latter case, the cutters are placed for from two to three hours in a low temperature unit providing for temperatures in the range from –100 to –150 F. At the end of this time, they are allowed to return to room temperature. This method of treatment is used after the cutter has been ground.

How to Cold Treat

The following procedure has produced excellent results where the cold treatment is used in conjunction with the regular heat-treatment of high speed steel parts of rather simple design:

The cutters are pre-heated to a temperature of 700 F. and are then transferred to a furnace kept at 1450 F. They are subsequently transferred to another furnace maintained at 2350-2375 F., and after being heated throughout, they are quenched in oil, lead, salt bath or air.

The cutters are then allowed to cool to approximately 150 F. When this temperature has been reached, they are placed in a low temperature unit at –120 F. for a period of three to six hours depending on size. At the end of this time, they are removed from the unit and allowed to warm to room temperature.

This is followed by tempering at 1050 F. for three hours, cooling to approximately 150 F., and a further treatment in the low temperature unit for three to six hours. After warming to room temperaure, the cutters are once more tempered at 25 F. lower than original tempering temperature.

For tools which are subject to hardening cracks such as tools of complicated design or having high cobalt content, the first cold treatment is eliminated and after quenching from 2100-2400 F., depending on specification, are tempered. This is followed by cooling to 150 F. and cold treatment to –120 F. same as indicated in the above procedure.

The cooling of high speed steel cutters from the hardening temperature of 2350-2375 to –120 F. should be continuous so that the transformation of austenite into martensite may be smooth through room temperature.

Salt bath hardening may be used on high-speed steel cutters of the tungsten, molybdenum and cobalt types for the purpose of providing the working surfaces with an extremely hard, shallow "case" which has a hardness greatly exceeding that of hardened high-speed steel.

The process consists of immersing the hardened and tempered tool, finish ground and sharpened, in a molten mixture of sodium and potassium cyanide. During the treatment, additional carbon and nitrogen are taken up by the steel to form very hard carbides and nitrides.

The temperature of the bath is normally within the range of 1000 to 1050 F., and the time of immersion may be from five minutes to one hour or more, depending on the size and type of cutter to be treated and the results desired. A few minutes may be sufficient for small cutters. In other cases, one or more hours may be necessary, although one hour will generally prove to be ample.

Quicker Than Carburizing

The case is similar to that produced in the carburizing of ordinary carbon and alloy tool steels. However, the cyanide case is produced in a fraction of the time required for carburizing, and no subsequent treatments are necessary to fix the case. The depth of case may vary between 0.0005 and

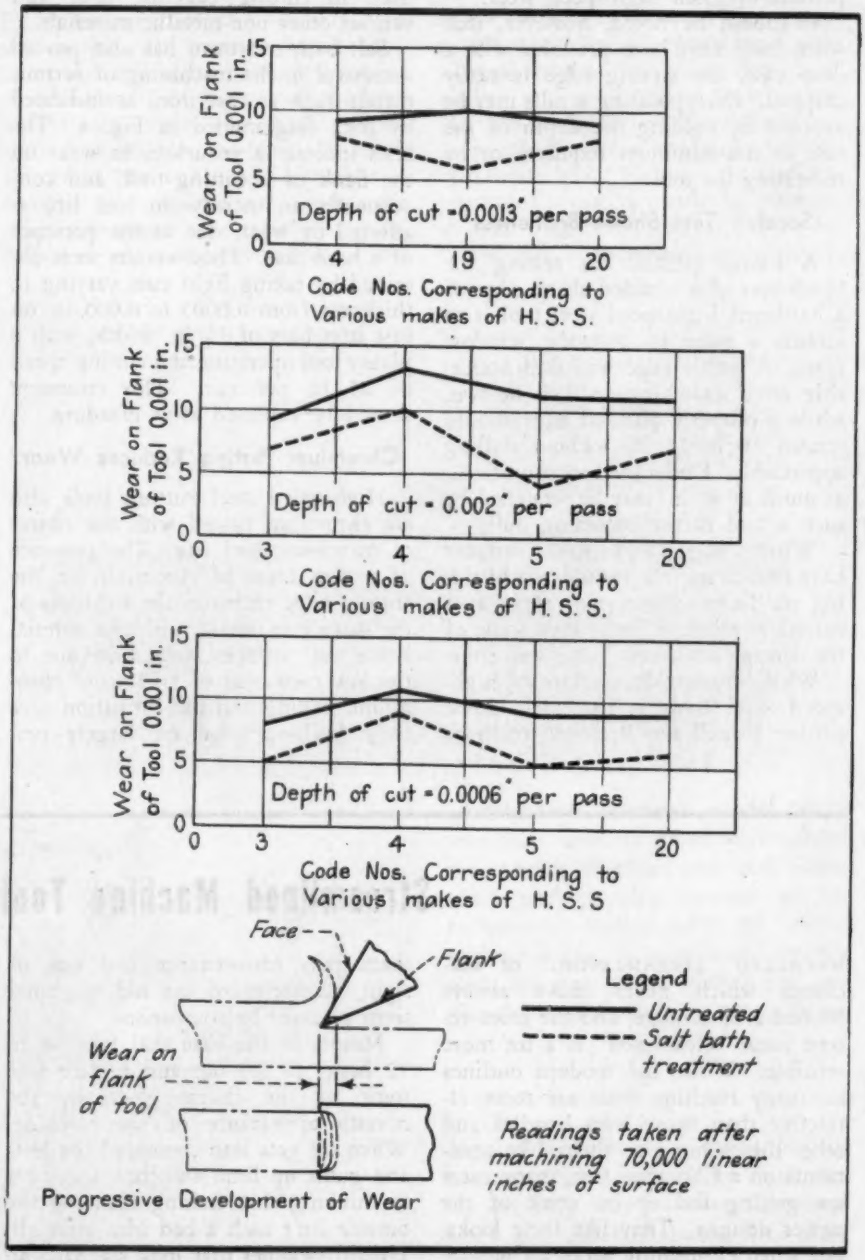


Fig.-4—Tests demonstrate that salt bath treatment reduces wear on the cutting edges of high-speed steel tools

0.001 in. as the time of immersion is increased. The shallowest case results when immersion is limited to between 10 and 20 minutes.

The hardness of the case is maintained even at temperatures up to about 1180 F., which explains the wear resistance of the nitrided tools under the high operating temperatures prevailing in metal cutting.

By increasing the hardness and wear resistance of cutting tools, cyanide treatment permits the use of cheaper alloys in place of the more expensive high-speed steels. For example, when tools made of 14 percent tungsten high-speed steel are provided with a hard case, their cutting life compares very favorably with that of the 18 percent tungsten high-speed steel.

It should be noted, however, that when tools have been provided with a deep case, the cutting edge is easily chipped. Disappointing results may be avoided by holding the depth of the case to the minimum required, or by re-heating the tool.

Scratch Test Shows Brittleness

A useful method for testing the brittleness of a nitrided sharp edge of a hardened high-speed steel tool is to scratch a pane of common window glass. A brittle edge will dull noticeably after scratching an inch or two, while a properly nitrided edge should scratch 10 to 15 in. without dulling appreciably. Under the best conditions, as much as 60 in. may be scratched by such a tool before becoming dull.

Where high-speed steel surfaces have been abusively ground, the nitriding of these surfaces may serve as a corrective measure for at least some of the damage which may have been done.

While the nitrided surface of high-speed steel tools is extremely hard, neither Brinell nor Rockwell methods permit making a quantitative evaluation of this super-hardened surface, because the case is very shallow and its influence cannot be detected. The hardness can be determined, however, by means of the Vickers hardness tester or superficial Rockwell "N" scale. A surface hardness equivalent to approximately 1100 Brinell appears possible through proper nitriding of fully hardened high-speed steel.

The life of a cyanided high-speed steel tool used in different kinds of work various from one to ten times that of an ordinary high-speed steel tool used under the same conditions. After nitriding, high-speed steel of the cobalt type, for instance, has shown a considerable increase in life when used in cutting bakelite, fiber and various other non-metallic materials.

Salt bath treatment has also proved successful in the machining of ferrous metals such as cast iron, as indicated by tests diagrammed in Fig. 4. The tests indicate a reduction in wear on the flank of a cutting tool, and consequently an increase in tool life as affected by wear, due to the presence of a hard case. These results were obtained by taking light cuts varying in thickness from 0.0005 to 0.005 in. on cast iron bars of ½ in. width, with a planer tool operating at a cutting speed of 25 ft. per min. This treatment should be repeated after grinding.

Chromium Plating Reduces Wear

High-speed steel cutting tools also are chromium plated with the object of increasing tool life. The presence of a thin layer of chromium on the cutting edge increases the hardness of the surface in contact with the material being cut, reduces wear, and due to the low coefficient of friction of chromium, galling and the formation of a large built-up edge are largely prevented. This is conducive to lower cutting temperatures, which reduces the possibility of the cutting edge becoming annealed while the tool is in operation.

These characteristics aid in increasing tool life and production, and conserve cutting tool material. In one example recently reported, an end milling cutter, milling bosses on a cast iron supporting frame after plating, machined 1100 pieces satisfactorily, where a standard high-speed steel end mill used previously machined only 250 to 300 frames between grinds.

A thick chromium deposit will provide longer wear than a thin deposit, but is more likely to chip and spall. Consequently a thin plating is to be preferred. The thickness of deposit which has been found to produce satisfactory results in the operation of cutting tools as related to the material being cut is as follows:

0.00005 to 0.0001 inch in machining hard steel.

0.0001 to 0.00025 inch in machining mild steel, cast iron and non-ferrous metals such as aluminum, brass, bronze, copper and zinc.

0.00015 to 0.0005 inch in machining non-metallic materials such as plastics and rubber.

In order to obtain satisfactory chromium plating and obtain a good bond between the plating and the base material, it is necessary to grind and hone with a fine stone that portion of the cutting edge which is to be plated. It is also important to clean the surface by dipping the cutting edge in a 10 percent hydrochloric acid bath for 30 seconds, followed by a rinse in cold water.

A third installment of Mr. Martellotti's series on milling cutters will follow in an early number.

Streamlined Machine Tools

SO-CALLED "STREAMLINING" of machines which never move always seemed a bit strange, and the more recent name "cleanlined" is a lot more sensible. While the modern outlines on many machine tools are more attractive than those with handles and other things hung on them, like ornaments on a Christmas tree, many users are getting fed up on some of the newer designs. They like their looks, but when cleanlining tucks all piping, junction boxes and the like away so carefully that the cost of getting at them puts maintenance cost out of sight, memories of the old machines seem pleasant by comparison.

Motors in the base that take 48 to 72 hours to get out and replace lose some of the charm given by the smooth appearance of the machine. When oil gets into concealed conduits and gums up limit switches, users get to thinking that tacking them on the outside isn't such a bad idea after all. Hybrid switches that look standard on the outside but that have been specialized inside, can tie up a much needed machine unless spares can be had. Special ball bearings where a bronze bushing would answer, also add to the trouble of the maintenance men and mean carrying a large number of spares.

These are a few of the reasons why some of the large users of machine tools are asking the gents who design them to put accessibility and ease of maintenance ahead of cleanlining their machines. They'd also like to have designers study machine tool operators, and put controls where contortionists are not necessary to handle them.

Wooden Models Aid in Selection Of Special Production Machines

BY C. A. SALMONSEN, ASSISTANT MANAGER
LYNN RIVER WORKS, GENERAL ELECTRIC COMPANY

PRODUCTION PROBLEMS that cannot be met by available equipment often indicate more than one possible solution. Consideration generally centers around the need for a specially designed machine or the conversion of an available machine to perform the required functions. Wooden models of the equipment under consideration can be most useful in reaching a final decision.

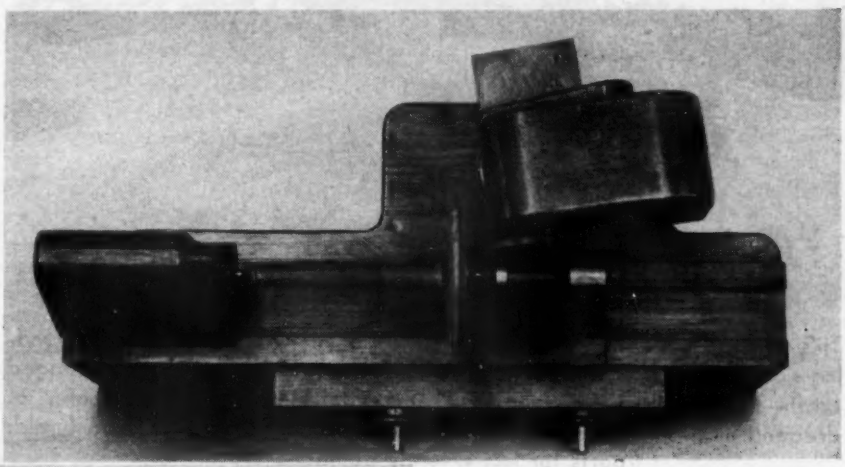
A typical example of how wooden models served to answer a production problem was presented at General Electric's Supercharger Division, Lynn River Works, in an order requiring the grinding of integral wheel and shaft assemblies. Four angles, ranging from 0 to 90 degrees, were required on each side of the wheel, and several diameters had to be ground on the shaft.

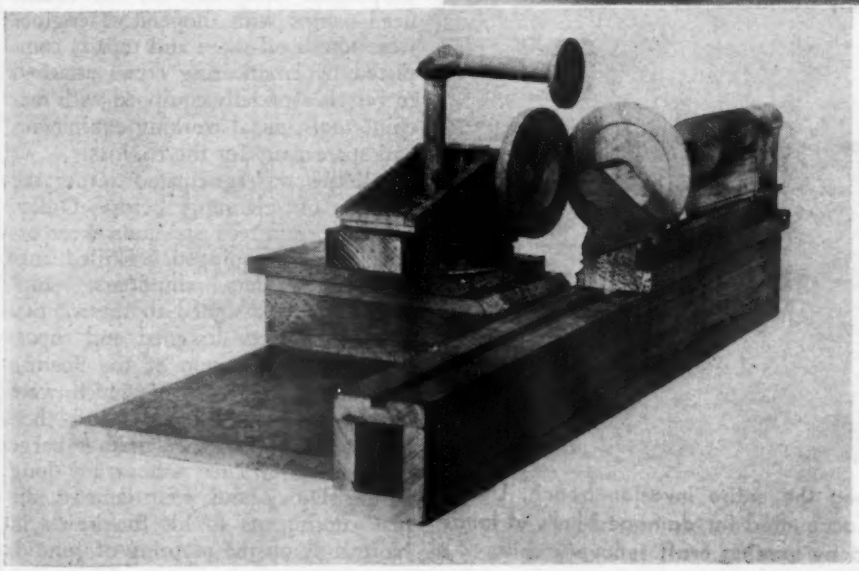
No standard grinder was available to perform the necessary work. The requirements indicated the need of either a specially constructed machine or the conversion of a standard grinder so that it could be equipped with raising blocks and an additional swivel under the wheel head.

It was decided to make quarter-sized wooden models of the machines under consideration, and of the several types and sizes of wheel and shaft assemblies being planned. This procedure promised a clearer picture of the alternatives with little drafting layout.

A model of the grinding machine incorporating the proposed changes was made in the pattern shop. A machine tool manufacturer made a similar wooden model of his special machine to the same scale. The model wheel-slide unit, its base, swivels and ways, the table top and its headstock and tailstock were made accurately. For the sake of economy, the ways were simplified to plain dovetail or tongue and groove, but were located correctly and marked with limits of travel. Non-essential parts, or those which could not interfere with the grinding head or the work, were omitted. Every relationship between wheel and work possible on the machines can be duplicated quickly and accurately to show capacities and limitations of the machines.

By using wooden models to test the operations being planned, marked improvements can be made in machine design. Suggested changes can be incorporated in the model immediately.





Quarter-sized wooden model of a proposed special grinding machine shows limits of wheel and work diameters and possible sources of interference. Relationship of wheel and work can be duplicated quickly and accurately to determine capacities and limitations of machines

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Special features of a model representing a converted grinder illustrates the auxiliary slide between the wheel head and machine base. This slide permits oscillating the wheel head assembly parallel to its spindle and at any desired angle with the work

Clear the Beaches!

BY WILLIAM J. HARGEST, AMERICAN MACHINIST WAR CORRESPONDENT

Landing Craft Recovery Units hit the Normandy beach on the morning of June 6 along with troops and supplies. These units repaired or destroyed craft damaged by beach barricades, mines and enemy action, keeping the beaches clear for the thousands of other craft waiting off the shore

ON THE NORMANDY BEACHHEAD—Here on the invasion beaches with cargo ships and naval vessels dotting the English Channel as far as the eye can see, one would not expect to find machine shops both afloat and ashore among the landing craft disgorging troops and war equipment. But here they are facilitating the landing of men and supplies in sufficient quantities to maintain the invasion tempo.

How did machine tools play their part in the invasion picture? You had but to see landing craft side by side along miles of the beaches to realize that every foot of available shore line was needed and that landing craft damaged by mines, beach barricades, and enemy action occupied space vitally needed by those craft awaiting offshore. It was in the removal and repair of these damaged vessels that machine tools, as well as welding and flame-cutting equipment, and all the tools found in a large job shop played their part.

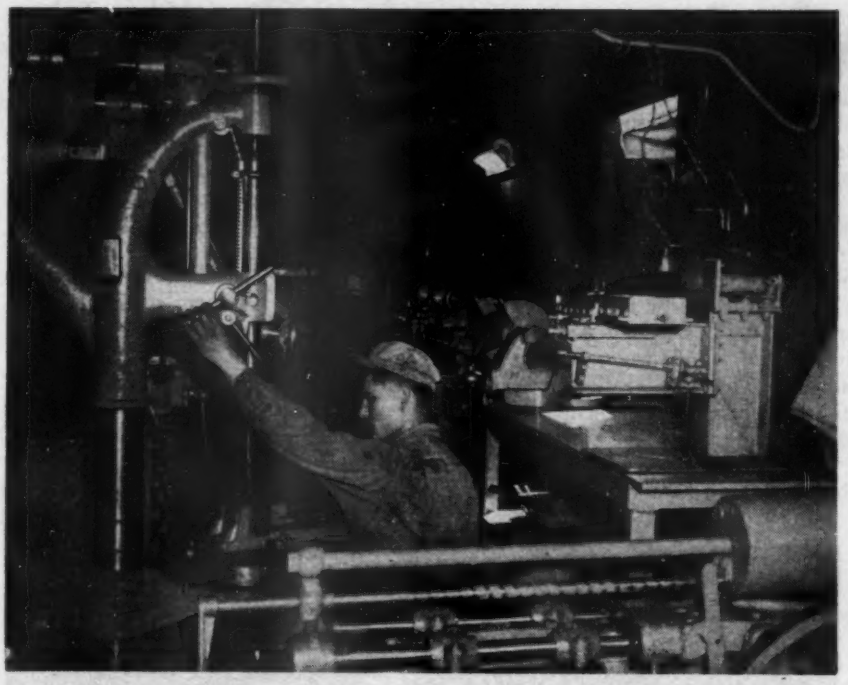
This scene typifies the invasion beaches on D-day, with landing craft standing side by side for miles along the shore. There was no room for damaged craft—they had to be repaired immediately and towed off-shore, or dragged high on the beach and destroyed. The latter were used to furnish parts for less severely damaged craft

Barricades of this type stretched along the entire invasion beach. Under water at low tide, these steel tenacles accounted for damaged hulls of landing craft that had to be repaired by landing craft recovery units

The damaged landing craft whether having only a bent propeller, or plates ripped asunder by the steel fingers of barricades or blasted apart by mines, had to be removed from the beaches. In some instances, tractor cranes raised the smaller craft from the water or the beach for quick repairs to rudders, propellers, propeller shafts and brackets, and hull plates. In other instances, these small craft were pulled high on the bench by tractors for heavier repairs or destruction; in the latter case, plates and propulsion equipment were salvaged for repairing less severely damaged vessels.

Larger craft severely damaged were made floatable by sealing damaged bulkheads before towing them offshore and finally back to England for complete overhaul. There was only one demand during those first hours in Normandy when success or failure hung in the balance. It was—"Keep the beaches clear." Practically all beach work had this one objective. Little or no effort was made to repair damaged propulsion equipment on the beachhead—ships with inoperative engines were towed off-shore and repairs completed by engineering crews attached to vessels especially equipped with machine tools, metal working equipment, and spare parts for the engines.

All this was anticipated during the months of planning before D-day. Landing craft recovery units were organized and equipped. Skilled machinists, welders, shipfitters, shipwrights were assigned to these units. Naval architects designed and supervised the construction of the floating machine shops, most of which were converted Thames barges, and then identified as LBE's (landing barge engineering). They were ready long before D-day and were among the first contingents to hit the beach in Normandy on the morning of June 6.



This is the interior of a truck similar to ones aboard LBE's. The machine tools, motor generator welding set and air compressor are utilized to repair damaged landing craft parts, and when necessary, to fabricate replacements from bar stock and steel plate

Each landing craft recovery unit, consisting of two officers and twenty men, were assigned an LBE. The forward section of this barge was converted into living quarters for the crew, while the amidships and aft sections were converted into a compact machine shop, including space for a 2½-ton truck, which in itself was a self-contained machine shop. Equipment aboard the craft proper included two 8-in. swing lathes, two drill presses, battery charging equipment, portable electric-welding units, gas-welding equipment, flame-cutting equipment, a power saw, bench grinders, and a small shaper. The barge was fully equipped with machinist's hand tools, gages, drills, taps, and portable pneumatic and electric tools. The truck aboard this craft carries a 6-in. lathe, a sensitive drill press, a power saw, two bench grinders, battery charging equipment, gas and electric welding units, flame-cutting equipment. It also carries a full complement of machinist's tools and gages, as well as portable electric and pneumatic tools. Both the barge and the truck have air-compressors of 60 cfm. capacity. In addition, the barge carries a full complement of shipwrights' and wood workers' tools, as well as spare parts for automotive engine equipment.

On one of the Normandy beaches, assigned to British forces, there were 15 of these landing craft recovery units, each with one LBE. Ten LBE's were anchored off-shore while five LBE units were stationed at specific intervals along the beach. It was the function of the recovery units ashore to ascertain the extent of damage to any craft, to repair the hull if possible, or to destroy it. Those units off-shore repaired engines, complete above-water hull repairs, and in general made damaged craft seaworthy for the trip back to England. They were assigned repairs to specific types of craft, such as LCI's, LCT's, LCM's, LEV's, LCVP's, and LCPL's since they were stocked with spare parts for specific landing craft assigned to them.

On the other hand, the landing craft units on the beach were responsible for repairs to all classes of landing craft, and to facilitate their operations they were given certain auxiliary equipment, including a terrapin (equivalent to the American duck); a 3-ton truck; a 5-ton tractor; one jeep; one 500 g.p.m. portable pumping unit; one portable electric welding unit; one portable flame-cutting unit including under-water cutting torches; one complete diving unit. Each landing craft unit ashore was in full operation within two hours after hitting the beach.

Here is a typical operation for the on-shore landing craft recovery units: A LST hit two mines on D-day, the first damaging the forward bulkhead and water-tight drop doors, and the second blasting and flooding the engine room. The recovery unit cut away damaged plates with flame-cutting equipment and shored weakened plates at the forward bulkheads with timbers. Cracks and seams were welded to make adjacent bulkheads watertight. At the aft end of the ship a section of the engineroom was sealed off by plates welded above the water at high tide and welded completely at low tide—the plates for this work were salvaged from destroyed craft. Water in undamaged parts of the vessel was pumped out and the craft finally floated at high tide for towing to the recovery units off-shore. Here the engines and propulsion equipment were repaired and the vessel made its way back to England under its own power. In this particular operation, officers and men of the recovery unit ashore worked 36 hours without respite, one of the crew running 700 ft. of weld in that time. Other vessels with broken keels, damaged longitudinal and transverse beams, and buckled hull plates were repaired under fire in record time.

Machinists with the landing craft recovery units were often required to machine from bar stock parts for hull repairs, as well as for engines and accessories. On the shore, where the 2½-ton truck from an LBE was stationed high on the shore above the LBE nosed into the beach, machinists worked around the clock making nozzles for cutting torches, sections of propeller shafts, straightening bent propellers, and making bolts and nuts. They machined and beveled plates of all sizes for sealing damaged hulls. Machinists with the LBE's off-shore were often required to make automotive engine parts from stock, improvising water connections, fans, parts of pumps, and renovating engine accessories, and even welding engine heads to blocks so that craft for all types could make the trip back to England under their own power for major repairs.

Aside from the landing craft recovery units stationed on this beachhead there are two other major maintenance units. The first is a landing craft recovery unit composed of four officers and 79 men. It was organized as a mobile land unit, and on D-day assisted the smaller landing craft recovery units on the beach. Several days later it moved inland and acted as a central shop for the five smaller units stationed along the beach.

This large unit is equipped with 24 trucks, ranging from ½ to 5-tons capacity, and one 5-ton mobile crane. Some of the trucks are fully equipped mobile machine shops. Others are

self-contained electric welding and air compressor units. Others are fitted with gas-welding and flame-cutting equipment. Two trucks have motor-generator sets for charging batteries for signal corps, tanks, trucks, and landing craft. One of the largest trucks serves as a salvaging unit for landing craft sunk off-shore and too badly damaged to be removed without first making under-water repairs; therefore, this truck has a full complement of diving equipment, including a 150 cfm. air compressor, under water flame-cutting equipment, and complete diving apparatus for four men. When this unit was visited by this correspondent, it was protected from air attack by a ring of anti-aircraft batteries.

The second large landing craft recovery unit on this beach-head was an LSE (Landing ship engineering)—a converted LST. The machine shop aboard this vessel was 40 ft. wide and 240 ft. long, and at one end of this room an elevator was installed so that small barges, terrapins, ducks and occasionally trucks could be lowered from the deck. This vessel is manned with an engineering crew of machinists, welders, shipwrights, shipfitters, pattern makers, blacksmiths, foundrymen, totalling 265 officers and men.

The LSE handles regularly scheduled motor overhauls for landing craft and ferry craft assigned permanently to the beach. It also makes those repairs to damaged vessels which cannot be undertaken by LBE's anchored off-shore. Repairs to large cargo ships and naval vessels at the beach-head are also assigned to the LSE.

Some idea of the work which this vessel is capable of performing can be obtained from the following list of equipment which it carries: 6 lathes, ranging from 4 in. to 12 in. capacity, and with beds up to 8 ft. long; 4 milling machines; 2 16-in. shapers; 1 openside planer; 2 6-ft. radial drills; 6 vertical and sensitive drill presses; 1 power hacksaw; 1 double end floor type grinder; 3 bench grinders; 1 punch press; 1 shear; 1 pneumatic riveter; 14 portable gas-engine electric-welding units; 1 bending brake; 1 band saw; 2 battery charging units with capacity for charging 80 batteries simultaneously; 5 complete gas welding units; 2 pantograph flame-cutting units; 2 bending rolls; and 2 150-lb. per sq. in. air compressors.

This ship is also equipped with a complete heat-treating shop having both salt-bath and oil-fired furnaces, water and oil quenching tanks, and carburizing units. It has a foundry, including crucible furnaces and metal molds; also drying units where motors and generators from sunken craft are reclaimed by heating at low temperature continuously for 96 hours. The ship is equipped with auxiliary pumping equipment used to sustain damaged craft afloat while repairs are made —this includes two 250-g.p.m, one 1,500-g.p.m. and four submersible 250-g.p.m. pumps. Electric power for all mechanical equipment aboard this LSE is furnished by four diesel-electric units. There is also a complete pattern-making and woodworking shop aboard. The ship carries spare parts for propulsion equipment on large craft, such as LST's.

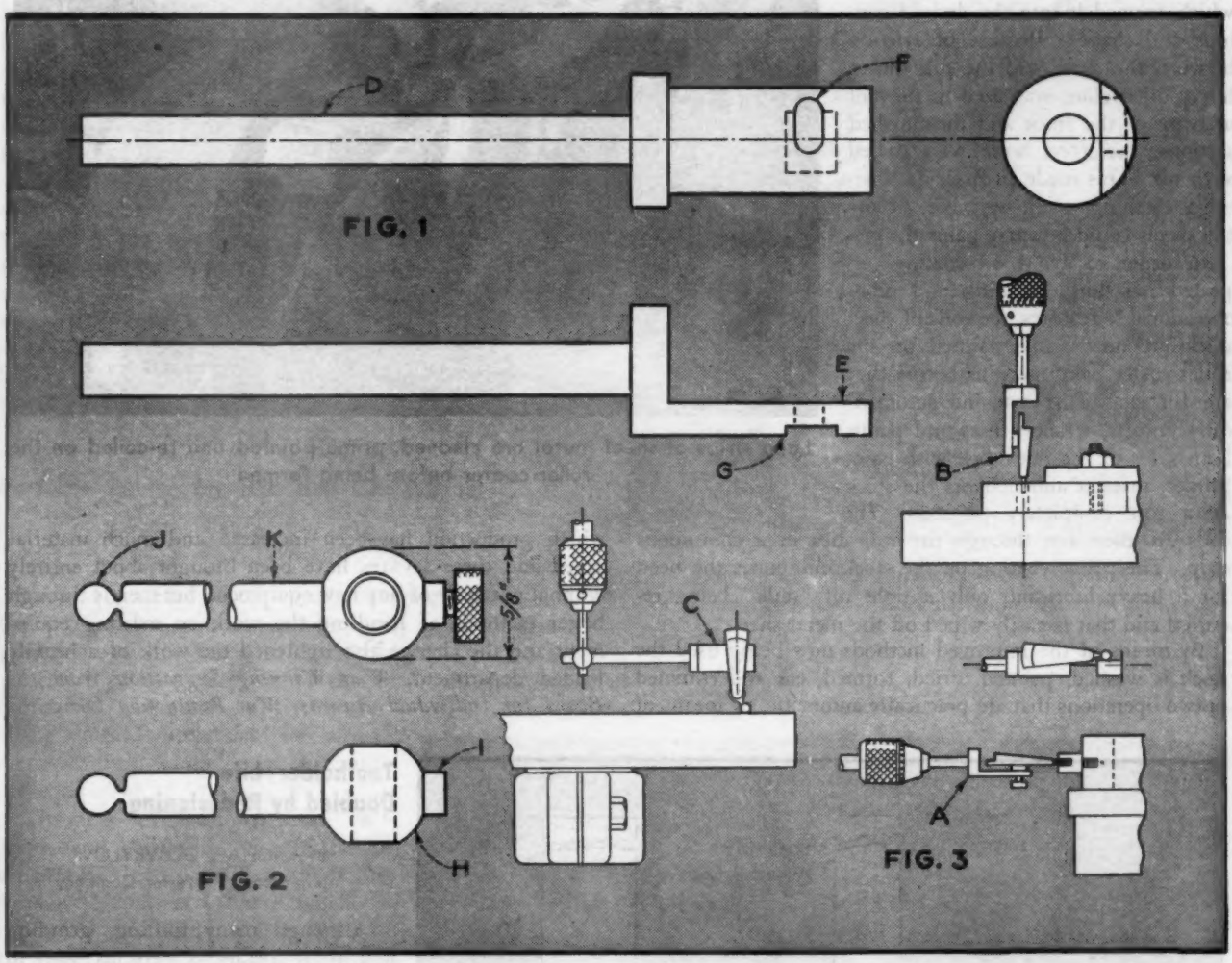
All landing craft recovery units, both ashore and afloat were and still are working on a 24-hr. schedule. While watching the crews of these units at work, repairing craft damaged on D-day and other vessels crashed on the beach by channel storms, one could not help but feeling proud to see machine tools and metal working equipment with American names doing their part on the beaches of Normandy. Here were Atlas, South Bend, Le Blond, and Pratt & Whitney lathes aboard ships and on trucks ashore; also Cincinnati, Milwaukee and Brown & Sharpe millers; Fosdick and Rockford radials. One came away with the feeling that these machines and soldier mechanics were as much responsible for the successes of D-day as were the men that actually stormed the beaches.

Rivet holes have been reamed from inside the hull of this damaged landing barge. The major operation in this repair was the shoring of the LST above the beach with heavy timbers and spurs. This work was done with the aid of divers attached to the landing craft recovery unit

Six hours after operations began on the LST the hull patch was being welded to make it watertight. The ship was shored up on the ebb-tide and floated on the next high tide

Practical Ideas

War-Winning Suggestions appearing on these pages were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to war production



This offset holder has been found useful in many kinds of shop operations in which indicators are used

Special Holder Varies Uses of Indicator

BY R. S. BUSTAMANTE

The offset indicator holder shown as Fig. 1 was originally made to locate buttons from a drill chuck as shown by *A* in Fig. 3, on work on the milling machine table and to true up holes in work on a drill press shown at *B*, of Fig. 3. With the right-angle extension shown in Fig. 2 it is possible to indicate tables of drill presses and similar machine tools, as shown at *C*. The indicator holder shown in Fig. 1 is made of ¾ in. C. R. steel, the stem *D*, is turned to 5/16 in. diameter and 2¼ in. long and answers very well the purpose for which it was designed. The offset *E* is milled to 7/32 in. from center to align the indicator. The elongated hole *F* allows adjustment, while the flat milled on the back at *C* gives clearance and freedom for the indicator thumbscrew.

The holder shown in Fig. 2 is made of ⅝ in. C. R. steel, of which *H* is turned to a ⅝ in. ball, drilled and reamed to 5/16 in. at a right angle; *I* allows ufficient length for a 5-40 thumbscrew, while *J* was included to offset any "homemade" appearance. While *K* is only ¼ by 2 in. it has adequate rigidness for its purpose. The foregoing assembly has been found to be a useful device and one which now forms a part of many tool kits.

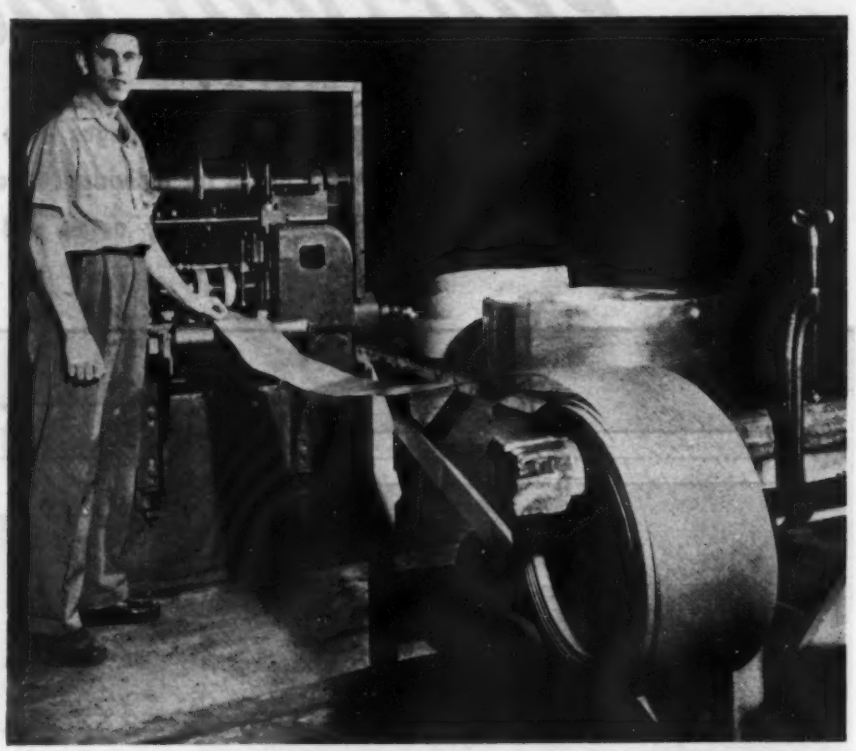
Paint Priming Rolled Aluminum Sheets

BY EDWARD G. KESSLER
Douglas Aircraft Company

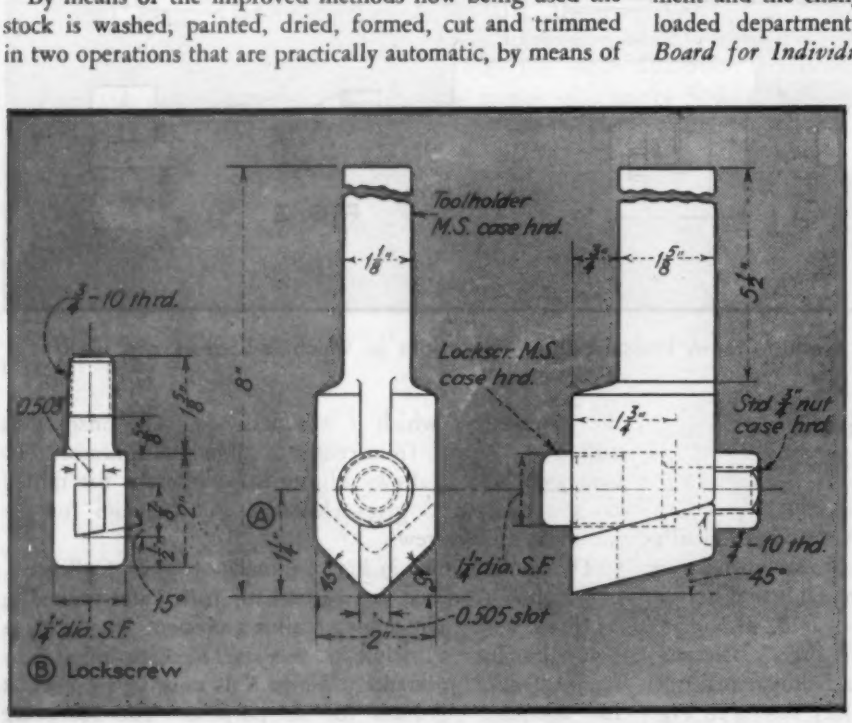
Sheet aluminum stock in coils of 250 ft. length, 6 in. wide, was cut to lengths averaging 12 ft. and then run through a roll forming machine, where it passed through a series of roll dies which formed it into the desired contour and shapes. Because of friction between the stock and the roll dies a heavy oil coolant was used to prevent marring of the stock and the finished sections, therefore, were well coated with oil. This made necessary a thorough cleaning, piece by piece, before the sheets could be spray painted.

In order to avoid oil coating, repeated handling, cleaning and other objectionable features, the coils of sheet stock are now prime painted on the roller coater paint machine before they are formed. This machine automatically uncoils, washes, dries and paints both sides of the raw stock with paint primer, dries it and delivers the stock in a roll completely primed. The coils are then run through the roll dies in a continuous strip. The prime coating on the stock eliminates the need for a heavy lubricant, only a light oil "milk" being required and that is easily wiped off the metal sheet.

By means of the improved methods now being used the stock is washed, painted, dried, formed, cut and trimmed in two operations that are practically automatic, by means of which production has been increased and much material saved and these savings have been brought about entirely without purchase of any new equipment, but merely through better methods of handling the work on existing equipment and the change also lightened the work of a heavily loaded department. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Long strips of sheet metal are cleaned, prime painted and re-coiled on the roller coater before being formed



This special toolholder provides double life for shaper tools and eliminates many milling and filing operations

Toolholder Life Doubled by Redesigning

BY MICHAEL GOWRYLOW
International Harvester Company

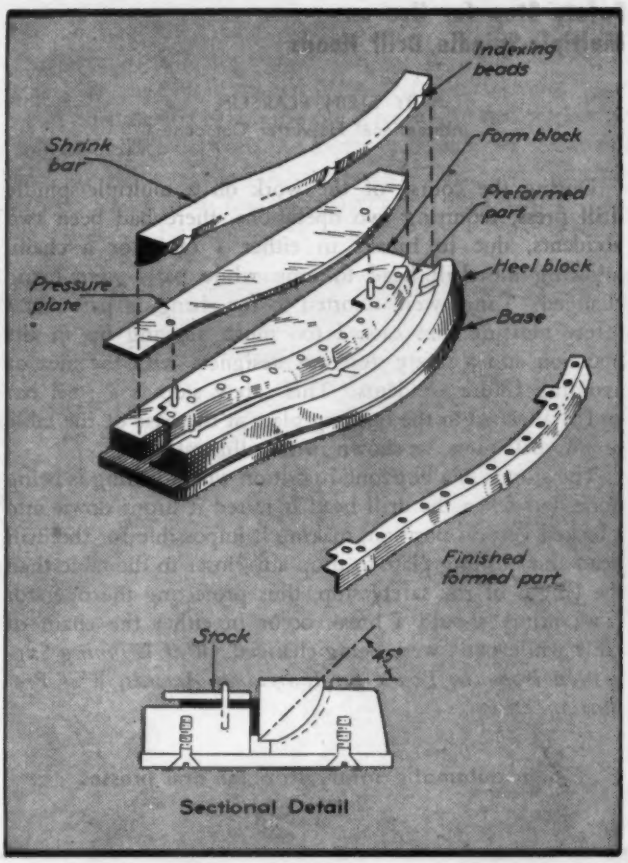
Although many milling, grinding and filing operations were necessary to make the standard form of toolholder formerly used in this plant on shapers, the tool was generally ruined whenever it hit a hard piece of stock. It could not be resharpened. As a result the present type of toolholder was designed. It takes a standard tool, sharpened to exact form. The cost of the revised toolholder is slightly higher than the unit formerly used, while milling and filing operations are eliminated. The use of this new type toolholder has brought about a considerable saving in man hours. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Hydro Shrink Block Eliminates Hand Forming

BY KENNETH MORSE
Northrop Aircraft, Inc.

A hydro-press tool, designed to eliminate hand forming, consists of an index pinned masonite form block, attached to a masonite base and has a mild steel index pressure plate for conventional forming. A contoured heel block of zinc alloy is attached to the form-block base. A zinc alloy shrink bar, contoured to conform to the flange form block and heel block is positioned to receive the pressure of the hydro press from above and slide on the contoured pitch of the heel block so as to exert pressure on a preformed flange, to shrink out the wrinkles. Form blocks may be inclined, by surfacing the bottom, to permit forming of flange angles under 90 deg. to nearly a vertical plane.

The wide range of application of the shrink block includes use for forming any parts with a contoured flange and joggle, or any part where previous methods had caused wrinkles, which usually require tedious, hand-forming operations, which this device was designed to eliminate. Use of the shrink block has brought about considerable savings in time and labor costs, making this tool an important aid to production. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Zinc alloy shrink block eliminates hand forming on small shapes such as the part shown in the illustration

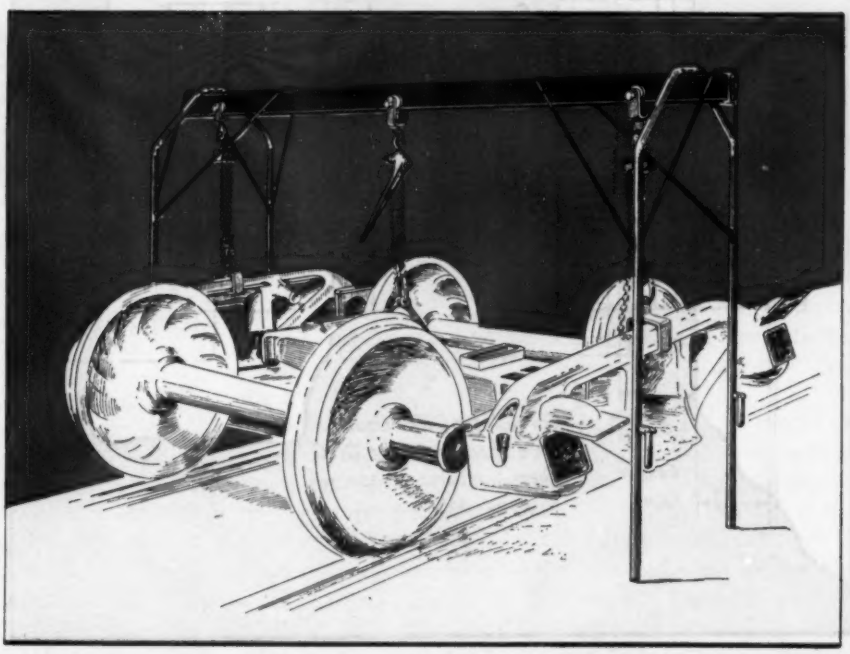
Portable Device for Handling Car Wheels

BY L. W. SAGLE
B. & O. Railroad Company

Replacing a pair of car wheels, weighing about half a ton, is a job that requires some ingenuity and a lot of manpower, mostly the latter, so that when some of the shop personnel of the car yards of the B. & O. Railroad at Storrs, O., suggested a device for changing car wheels that was a real labor saver it was adopted as standard equipment.

The new device known as an "A" frame and shown in the illustration consists of three pull-lift chain hoists suspended from a monorail which is supported at each end by a framework, the shape of which gives the device its name.

The middle hoist is used for raising the bolster, permitting the removal of the springs. The other two hoists are then used to lift the side frames sufficiently to clear the journals and swing them to each side and the wheels are then rolled away. The amount of manual labor required has been reduced to a portion of that required formerly, and the use of this device in railroad yards assists materially in expediting the installation of new wheels, thereby greatly reducing the "out-of-service" time of rolling stock that is urgently needed under wartime conditions.



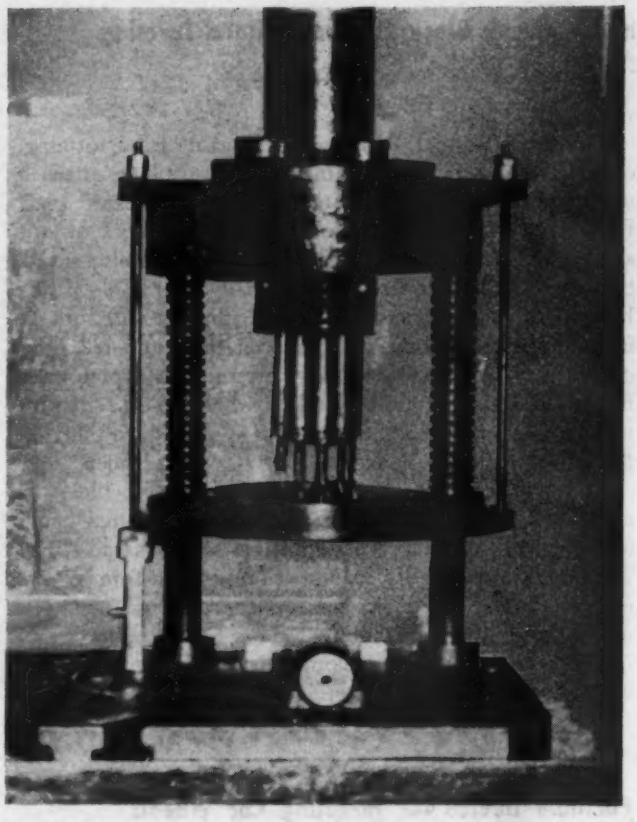
Car wheels and trucks in replacement jobs are now being handled by chain hoists instead of manually

Safety Stop for Use on Multiple-Spindle Drill Heads

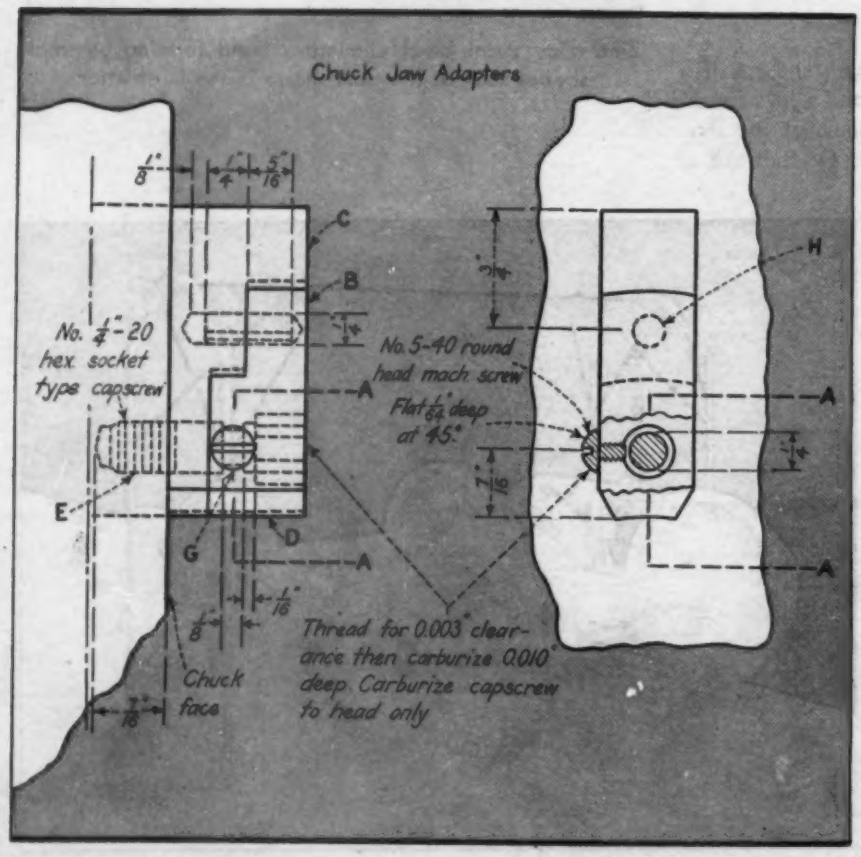
BY STEIN PEARSON
International Harvester Company

During the course of the work on a multiple-spindle drill press, requiring two operations, there had been two accidents, due to breaks in either a cable or a chain, allowing the drill head to drop while parts were being changed. Tongs were resorted to for changing parts, as a safety measure, but caused too much slowing up in the operaion and a safety stop was designed, with the idea of avoiding future accidents. This safety stop is a steel bar and is attached to the bushing plate at the base of the table of the drill press, as shown in the illustration.

The stop is in a horizontal position when drilling is being done, but when the drill head is raised it drops down into a locked vertical position, making it impossible for the drill head and bushing plate to drop any closer to the table than the length of the safety stop, thus protecting the operator from injury should a break occur in either the chain or cable while parts were being changed. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



An automatic safety stop for drill presses



Adapters for light lathe work which were designed because of the non-reversibility of chuck jaws

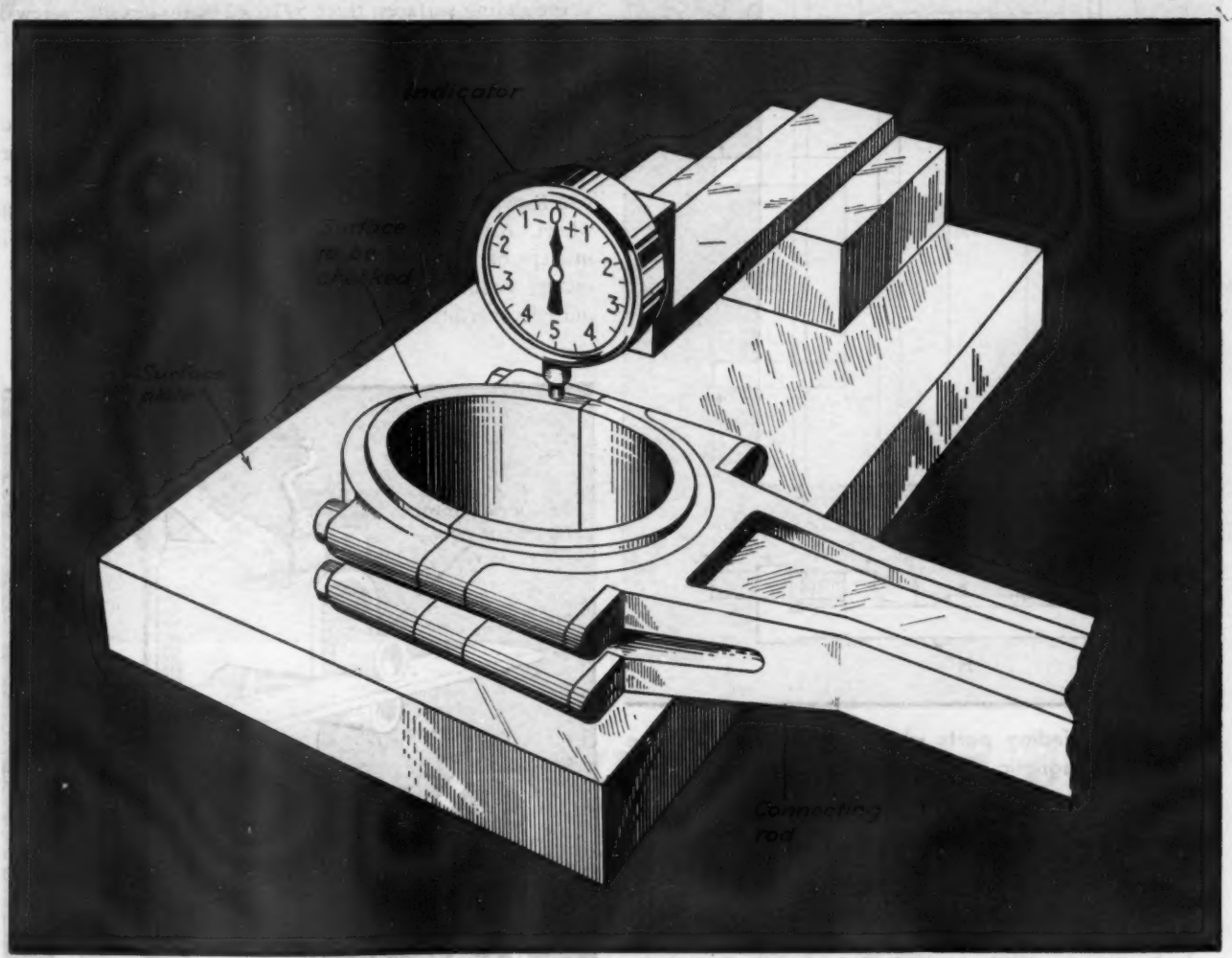
Chuck Jaw Adapters

BY RALPH R. WAECH

The chuck jaw adapters, the details of which are shown in the accompanying illustration, were designed for a small speed lathe which is used for miscellaneous work. The principle of these adapters can be used for any chuck where heavy torque is not required. The design of these adapters was brought about by the fact that the chuck jaws were not reversible. This type of chuck was made with the shorter jaw step facing the inside of the chuck. When chucking small diameter work the long jaw step protrudes beyond the short step and with such a condition filing and polishing cannot be done up to the jaw's grip on the work. Such a situation makes the repair of short work very difficult and sometimes impossible.

The adapters are built for three jaws. One jaw is shown in the illustration. The three chuck jaws were first annealed. S.A.E. 1030 steel can be used for the adapters. Adapter *B* is formed to fit chuck jaw *C*. A few thousandths of a inch of taper can be left on the chuck jaw adapter at *D* to

allow for spring movement of the adapter from the chuck jaw when under strain, although the adapters were not designed for a heavy strain. Cap screw *E* has an undercut for machine screw *F* at *G*. This undercut prevents the cap screw from becomnig lost from its adapter. Pin *H* is a 0.001 in. press fit into its adapter and has 0.0015 in. clearance into the chuck jaw. The pin's flat at *H* is for air escape. The jaw's adapters and pins are heat-treated as desired. Cap screw *E* and machine screw *F* can be heat-treated with the use of clay for thread protection, or can be carburized Carburizing will impregnate carbon, so about 0.003 in. clearance must be machined to allow for surface rise. The main purpose for hardening the screws is to make a lasting contact surface between the undercut of the cap screw and the dog point of the machine screw. This same principle can be followed in making adapter for other lathes.



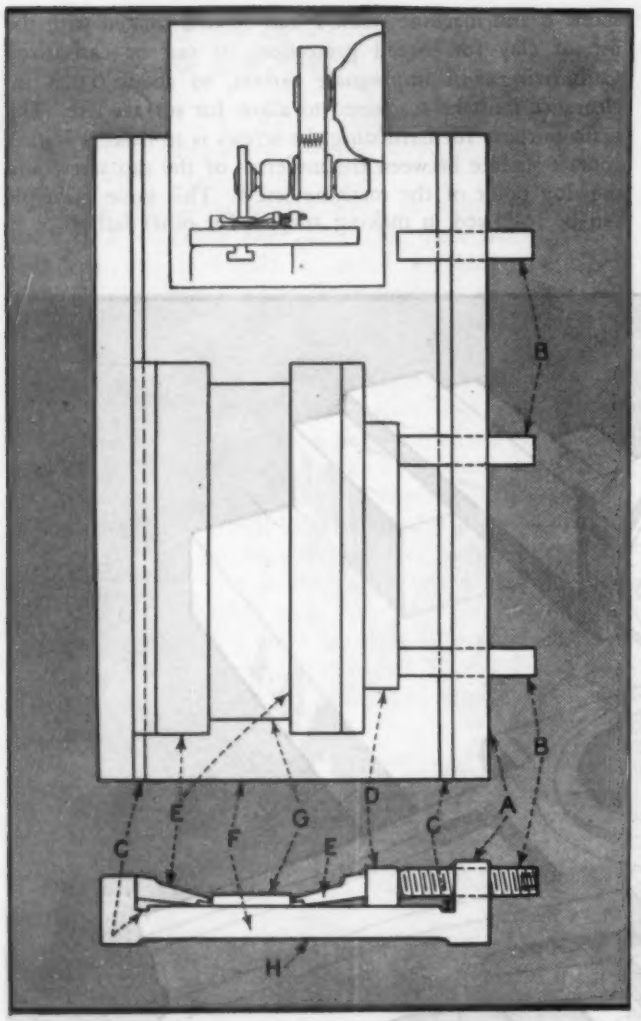
Method of testing a connecting rod bearing by means of an indicator gage

Indicator-Type Gage For Checking Connecting Rods

BY BIGOLJUB DEZARAN AND JOSEPH SALMONOWICZ
Packard Motor Car Company

The method of inspecting connecting rods at this plant formerly consisted of placing the rods on a surface plate and measuring them with a vernier height gage, with an indicator attached. After a rod had been placed on the plate the gage was used to check the dimension and trueness of the part at four points, or more, around the circumference of the bearing surface. The close tolerance required in this work required the highest accuracy, so that the work could be entrusted to experienced workers only, and even then it was a slow, time-consuming method. These factors brought about the development of the indicator-type gage illustrated.

With this type of gage a connecting rod is placed on the base and moved under the indicator rod and readings can be quickly taken at many points, or, in fact, all around the circumference of the bearing edge of the rod if desired. It is estimated that 50 percent more rods can be checked in a given time by the indicator gage method and with greater accuracy than formerly and the work can now be done by a comparatively inexperienced operator. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



A vise for grinding parts which can be used when a magnetic chuck is not available

Conversion of Power Roll for Burring

BY WILLIAM C. KUSTER
Murray Corporation of America

In burring operations on parts pierced with many holes the process we usually followed required the use of a drill press, hand reamer and motor-operated burring tools. It was a slow, monotonous method and frequently resulted in many elongated and chipped holes. In order to overcome these difficulties a set of hardened steel rolls was designed for installation on a power roll. Felt wiping pads were inserted above the upper and below the lower rolls. The wiping pads keep the rolls clean, preventing chips from causing slug marks.

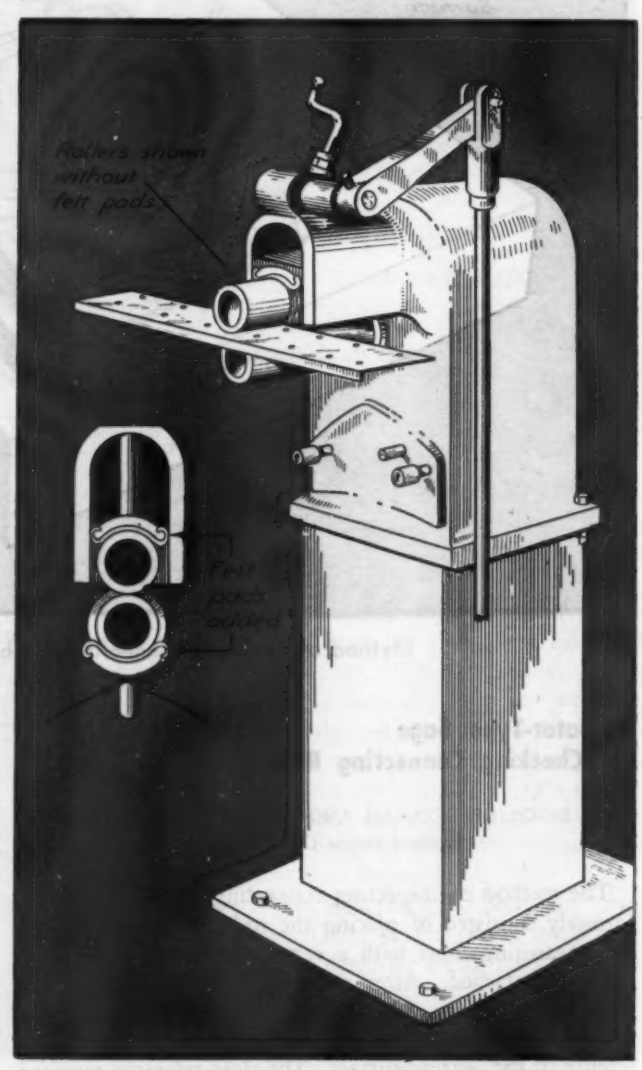
The hardened rolls will withstand burred holes in stainless steel and alloys. They have shown by performance that they are an improvement over previous forms of burring equipment by producing cleaner finishes and by reducing the burring time, in most cases by a ratio of seven to one. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Vise for Clamping Parts in Grinding Operations

BY VERNE LOOMIS

When a magnetic chuck is not available many jobs can be handled on a grinding vise of the type described herein, with the assurance of satisfactory work. The part *A* was made of an iron slab and finished to $\frac{3}{4}\times4\frac{1}{4}\times7$ in. The working surface was machined down to 5/16 in. from the top; the recess *C* made it possible to regrind the surface, *F;* the counterface, *H,* allows the two outer edges to act as the sliding surfaces; three $5/16\times1\frac{1}{2}$ in. headless screws, *B,* are for adjustment against parallel *D,* that backs one of the holddowns, *E,* while the other backs against the projected 5/16 in. wall at the left on *A.*

The work, *G,* is placed between the holddowns, *E,* the screws, *B* which when applied rigidly hold the work for the grinding operation shown in the diagram by sliding the vise forward and backward on the table under the grinding wheel. A set of gage blocks, ranging from 1/16 to 0.1 in., in steps of 1/16 in., was ground on this device with satisfactory results, with only a small amount of lapping required for a finish.



Burring rolls with and without felt wiping pads

Back of this line of finished after-body assemblies for Naval torpedoes are long hours of accurate machine work and fitting operations. Careful tool planning makes mass-production possible

Production of Torpedo Center Units Requires Heavy-Duty Equipment

By CARL G. PREIS, Vice President and General Manager
Amertorp Corporation, Division of American Can Company

MASS PRODUCTION of naval torpedoes, including the task of making the jewel-like gyroscopes that control the accuracy of the torpedo while on its way to its target, has been accomplished at the Forest Park Naval Ordnance Plant through new manufacturing techniques worked out by American Can Company engineers and the Navy's torpedo experts. Built, staffed and operated for the U. S. Navy by the American Can Company, this giant Amertorp Corporation plant is equipped to make the torpedoes used from aircraft, surface vessels and submarines. These units vary in size and, to some extent, in design. Each must be made to meet exacting standards for accuracy and finish.

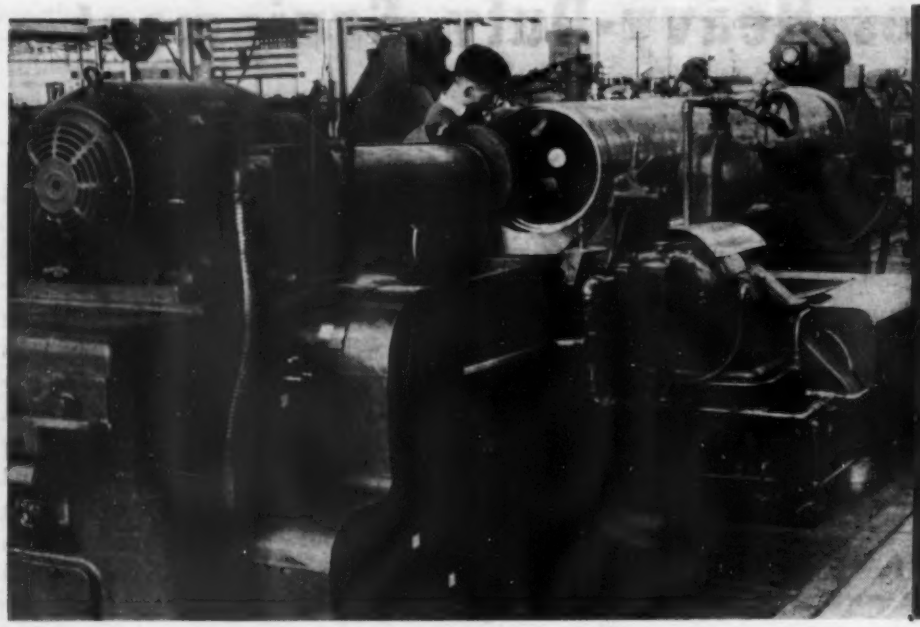
Consisting of some 5,000 precision-made parts, an airborne torpedo weighs more than a ton and costs approximately $12,000. This is a small price to pay for the destruction of a $50,000,000 enemy battleship. The types used from surface and under-water craft are heavier and more expensive. Whether compared on a size or a weight basis, the torpedo is the most intricate and most expensive weapon of naval warfare.

Ninety-five percent of the present executive and administrative staff at Amertorp was chosen from the

American Can Company's many plants. These men were trained for six months at the Naval Torpedo Plant at Newport, where they worked with Navy experts in developing torpedo manufacturing techniques. They have supervised the training of thousands of employees at the Amertorp plant, which is credited as the largest industrial operation devoted to the manufacture of torpedoes in the Western Hemisphere.

Before torpedo production started, Amertorp instituted a training school program to provide skilled workers. The program is still in effect. Training classes are conducted in four Chicago-area high schools, in the hours between midnight and 8 a.m., with eight-week specialized courses in machine operation, precision inspection, and assembly. After completing the initial courses, student employees enroll in the plant's own training school for a two-week "finishing course" before starting plant work.

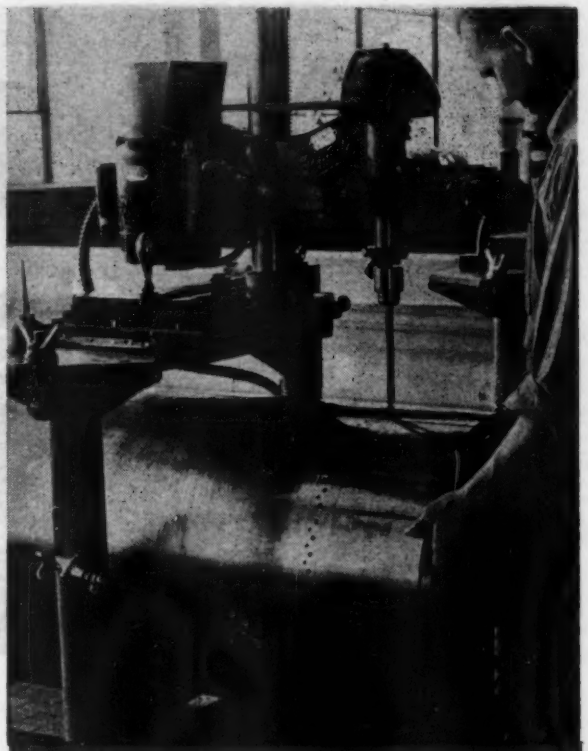
Each torpedo consists of three main assemblies: A forward body or head, which may be a dummy or "exercise" head for trial runs or a "war head" filled with high-explosive for actual combat purposes; a center unit, which is, principally, a large flask for



holding air under heavy pressure; and an after-body assembly which houses the driving engine, the gyroscopes which control depth and direction of travel, and the two contra-opposed driving propellers and horizontal and vertical rudders. Parts for these units range from the very heavy steel forgings used for the flasks and war heads, to the very small and highly accurate control valves and gyroscope parts which require the utmost care in machining and assembly. Typical of the large, heavy-duty equipment used in machining the heavy flask and war head forgings are the flask boring and internal-grinding units shown in accompanying illustrations.

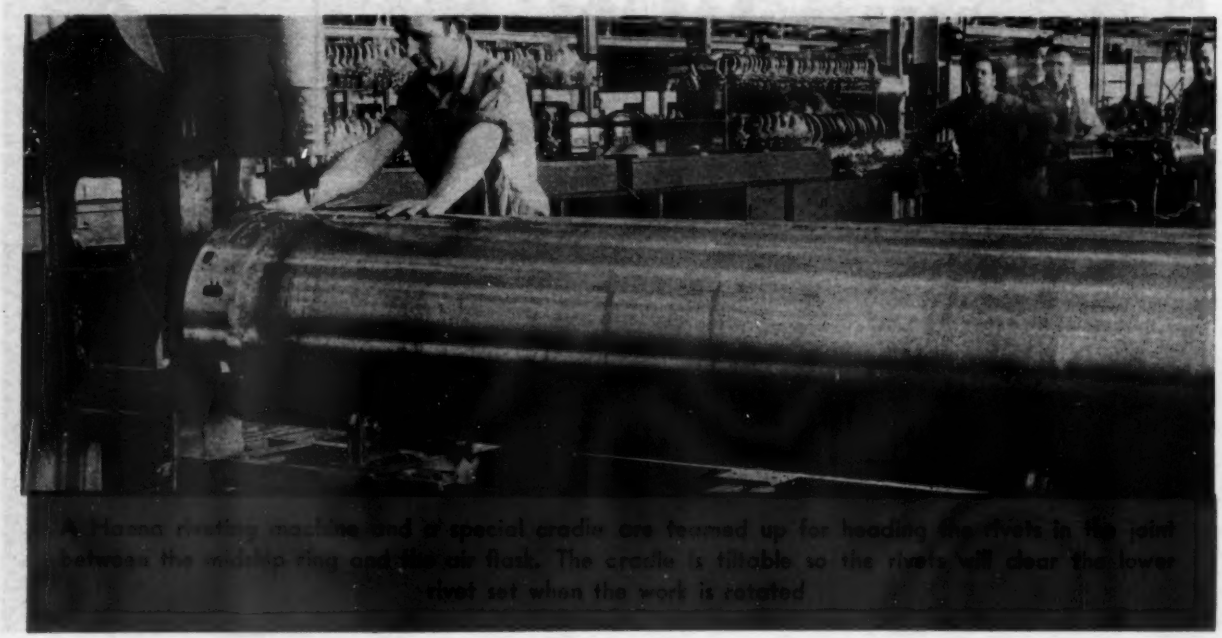
The flask forging shown being finish bored in a large Wickes double-end machine is 11 ft. long. This machine has a 78-ft. long bed and each of the boring bars weighs 7 tons. Two men operate this machine, one for each of the boring heads. Carbide-tipped tools are used for boring the several inside diameters of these parts. One of the heads is fed longitudinauly for a distance of 79 in., while the other is fed 54 in. inside the work piece. Most of the internal diameters of the flask forgings are finish ground in one of several 24 × 78 in. Heald internal grinders. The 16-in. diameter grinding wheel used for these operations has a 3-in. wide face.

One assembly operation on the center section of a torpedo consists of joining a short "midship ring" to the longer air flask tube. This is a riveted joint and the 128 rivet holes are drilled around the circumference of the joint in a special multiple-spindle Kingsbury drilling machine in which the flask is set vertically. Next, the flask and midship ring assembly is placed horizontally in a cradle for countersinking these rivet holes. The countersink is driven by a Buffalo No. 15 bench drill mounted on a plate carried by two vertical posts, one at each side of the cradle.

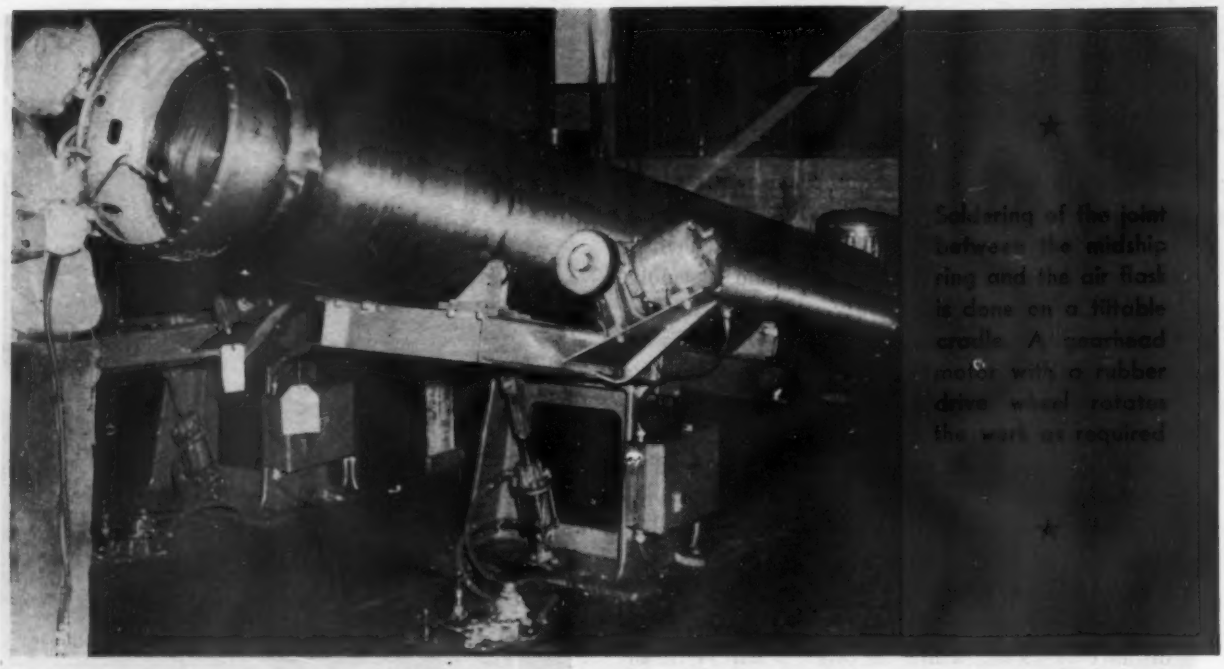


Rivet holes at the joint between the midship ring and the flask body are countersunk with this special drill unit mounted above the cradle supporting the flask

This plate can be swung to one side so that the drilling unit clears the flask tube when it is being removed from the cradle. Rollers built into the cradle permit the drill press operator to rotate the assembly from one hole to the next. Similar units are employed for drilling, countersinking and tapping the midship ring for the various valve bodies and other units which



A Hanna riveting machine and a special cradle are teamed up for heading the rivets in the joint between the midship ring and the air flask. The cradle is tiltable so the rivets will clear the lower rivet set when the work is rotated



Soldering of the joint between the midship ring and the air flask is done on a tiltable cradle. A gearhead motor with a rubber drive wheel rotates the work as required

are mounted within the ring as the assembly of the torpedo progresses.

It is of interest to note that the base of the drill press used for the above countersinking operation slides in rails on the support plate so that the drill spindle can be moved longitudinally for a short distance along the unit being drilled. This makes it easy for the operator to line up the drill spindle with the work. All of the holes are drilled or countersunk radially, so the center of the spindle always is in vertical alignment with the axis of the cylinder when it is in position in the cradle.

A Hanna pneumatic riveting machine is used for heading the rivets in the joint between the midship ring and the air flask body. For this operation, the work is placed horizontally on the rollers of a special cradle which can be adjusted longitudinally to bring a row of rivets in line with the rivet sets, and which has rolls to permit rotating the work from one rivet to the next in a given row. An air cylinder, which is controlled by a foot valve, raises the forward end of the rack to lift the round head of the rivet out of the seat in the lower riveting die so the operator can rotate the work to bring the next rivet in line. There are two rows of rivets at the joint in the assembly shown. Each of these rows contains 64 rivets. In

A special cradle has been developed for soldering stiffening rings in torpedo exercise heads. It can be adjusted to suit the convenience of the operator

order to prevent distortion of the midship ring when driving the rivets, the operator first drives every eighth rivet in one row to anchor the midship ring firmly to the flask cylinder. Then he finishes that row of rivets by heading every rivet in the row in rotation. He then moves the work longitudinally to bring the next row of rivets in line with the dies and heads every rivet in the row in rotation. At the next operation the heads of these rivets are ground off flush with the cylindrical surface of the flask in an American 36-in. engine lathe having a Hisey-Wolf cup wheel grinder on a special bracket at the back of the carriage. The flask is held in a four-jaw chuck and a large steadyrest for this grinding operation.

Following the riveting of the joint between the midship ring and the flask cylinder, the inside of this joint is soldered to insure a water-tight and air-tight joint. The flask assembly is placed horizontally on a tiltable cradle, and the soldering operation is done by hand with a city gas-oxygen torch. An air cylinder with a foot-controlled valve tilts the cradle so the soldering operation can be performed conveniently by a man standing at one end of the cylinder. A roller on a vertical spindle at the other end of the cradle insures against the flask slipping off the cradle when it is in a tilted position. During the soldering operation, the work is rotated on the cradle by a ⅓ hp. gearhead motor having a rubber-faced wheel in close contact with the outside surface of the flask. An electric pedal control switch operates this motor to rotate the work as the soldering operation progresses. This switch can be moved to either end of the rack.

Another soldering operation for which a special cradle has been developed is the assembly of stiffening rings in torpedo exercise heads. These assemblies are considerably lighter than the air flask assembly, so the cradle is of less substantial design. However, it has the advantage of being adjustable to suit the convenience of the operator who can sit in front of the work. The work is rotated by hand as the soldering operation progresses.

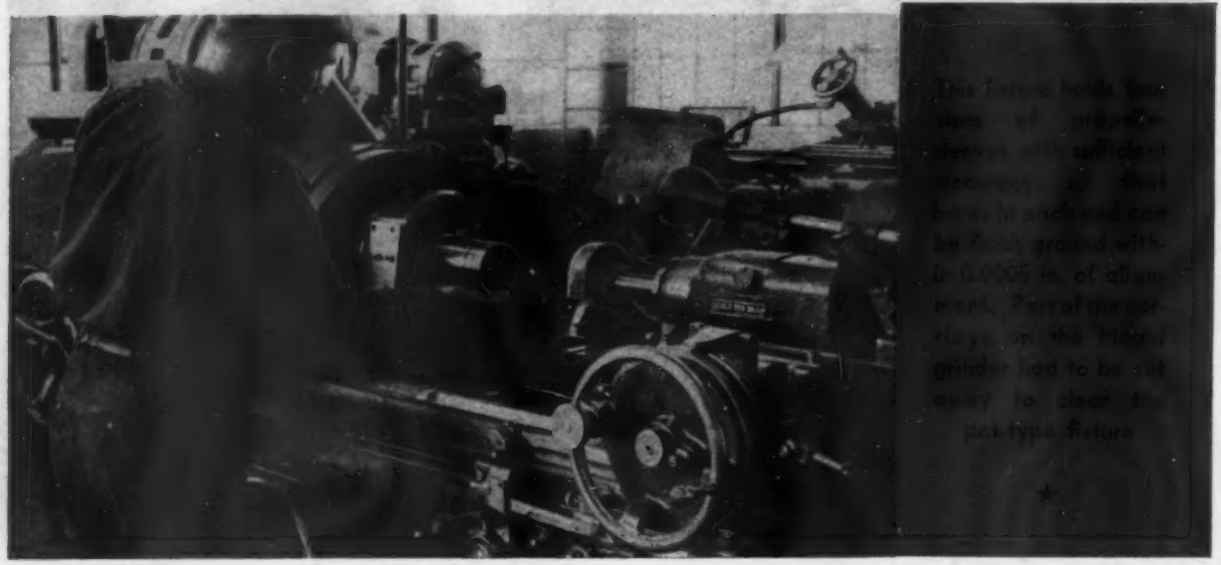
Because of the close tolerances necessary on practically all of the individual parts made for the drive and control mechanisms that go into the torpedo after-body, considerable development work has been necessary in the machine shop. In many instances, special fixtures have been necessary, and in a few cases special machines have been designed and built so that the required dimensional accuracy or fineness of finish could be obtained economically on a mass-production basis. Special machines were designed and built for cutting the integral bucket blades on the turbine runners, and other special machines were developed for finish filing certain surfaces of these blades to insure the exacting requirements. In addition, some special precision honing machines were designed and built for finishing bearing surfaces on some of the gyroscope spindles and bearings.

Among the special fixtures which have helped solve difficult production problems is a special honing fixture. In this fixture, the locking rack to be honed is clamped in a V-block supported by vertical and horizontal steel leaf springs so that the work is free to float during the honing operation. The ⅜-in. diameter hole in this part is 2½-in. long and must be finished to within minus 0.000, plus 0.0005 in. of the specified diameter. This overcame earlier trouble that was experienced in trying to hone these holes with the

part held solidly in another type of fixture.

The use of soft steel chuck jaw inserts has helped speed production in the lathe department on parts that must be held to very close tolerances. One of these set-ups is used for drilling and boring a pivot hole in each end of the shaft of the gyro wheel. The 0.280-in. diameter hole has a tolerance of minus 0.000, plus 0.0004 in. Four tools are carried in the heavy tool block on a 14-in. Monarch lathe for this operation. The part is held in a precision three-jaw chuck. First, a ⅛-in. drill is used to produce a hole 0.499 in. deep. Then the cross-slide is moved to bring a ¼-in. drill into line with the spindle and this tool is used to produce a hole 0.343 in. deep within plus or minus 0.001 in. This brings the hole to within 0.025 in. of the bottom of the finished hole. Then, a ¼-in. flat-bottom drill is used to bring the depth of the hole to within 0.002 in. of the required depth. Finally, the hole is finished bored and bottomed with a single-point high-speed steel tool in the same tool block. Considerable care must be exercised to insure that the holes in each end of the shaft are in alignment, since the gyro wheel spins on bearings fitted in these holes and the accuracy of these bearings governs the accuracy of the wheel rotation.

The internal grinding of the bores of propeller sleeves caused considerable difficulty until a special chucking fixture was developed for use on a Heald internal grinder. The finish-ground bores in each end of these sleeves must be concentric within very close limits, and it is not possible to grind the two bores in the same setting of the piece. The fixture is designed to position four sleeves, two for each of the principal types of torpedoes being made at this plant. It is not necessary to change chuck jaws or other fixture parts when changing over from one sleeve to another. A tapered adapter ring and a tapered center plug built into the back end of the fixture insures alignment of the two bores when the chuck jaws are closed. Diameters of the bores are ground to within plus 0.001, minus 0.000 in. and the bores align within 0.0005 in. from one sleeve end to the other.



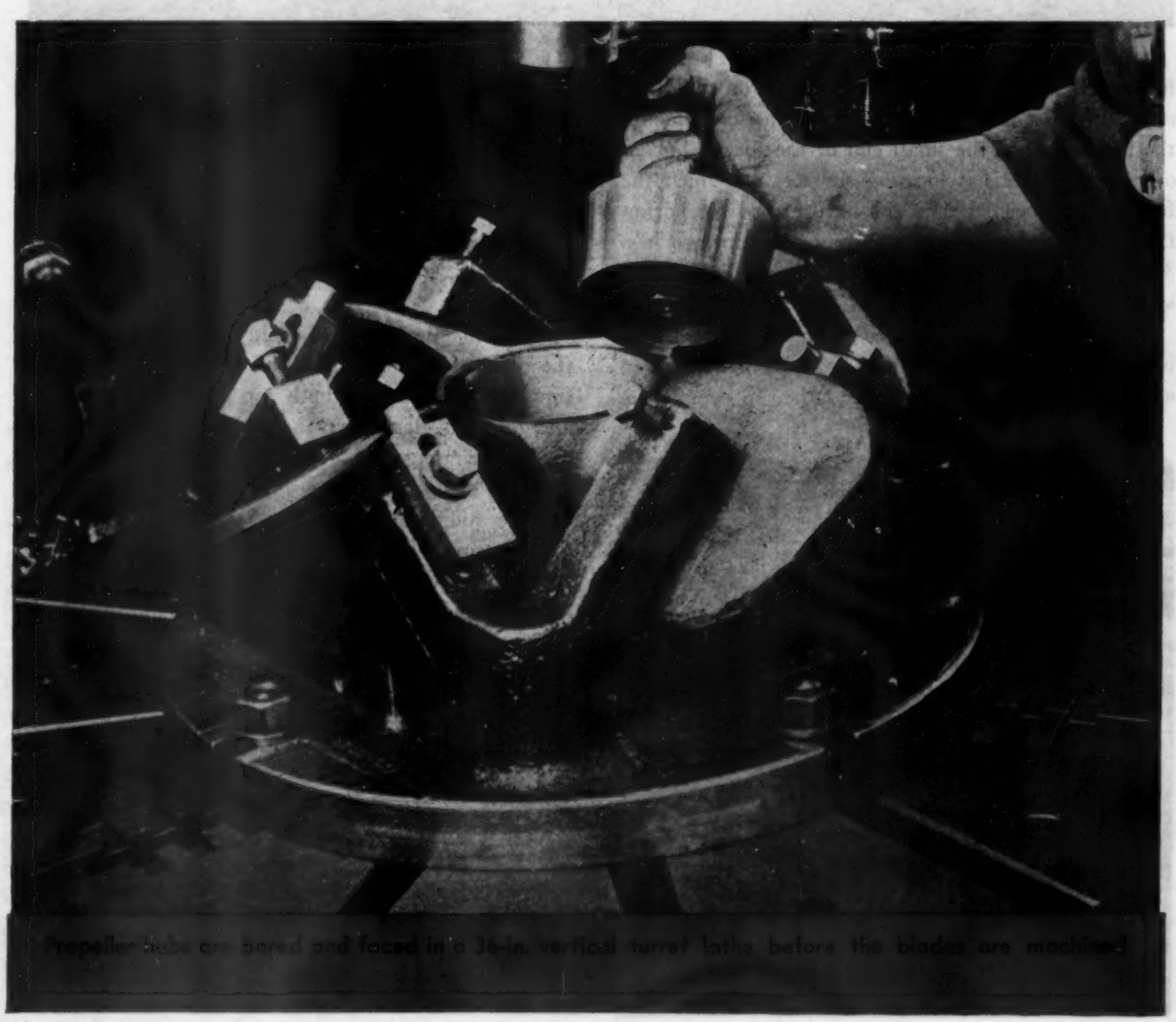
Naval Torpedo Propellers Machined to Precise Dimensions

BY CARL G. PREIS, Vice President and General Manager
Amertorp Corporation, Division of American Can Company

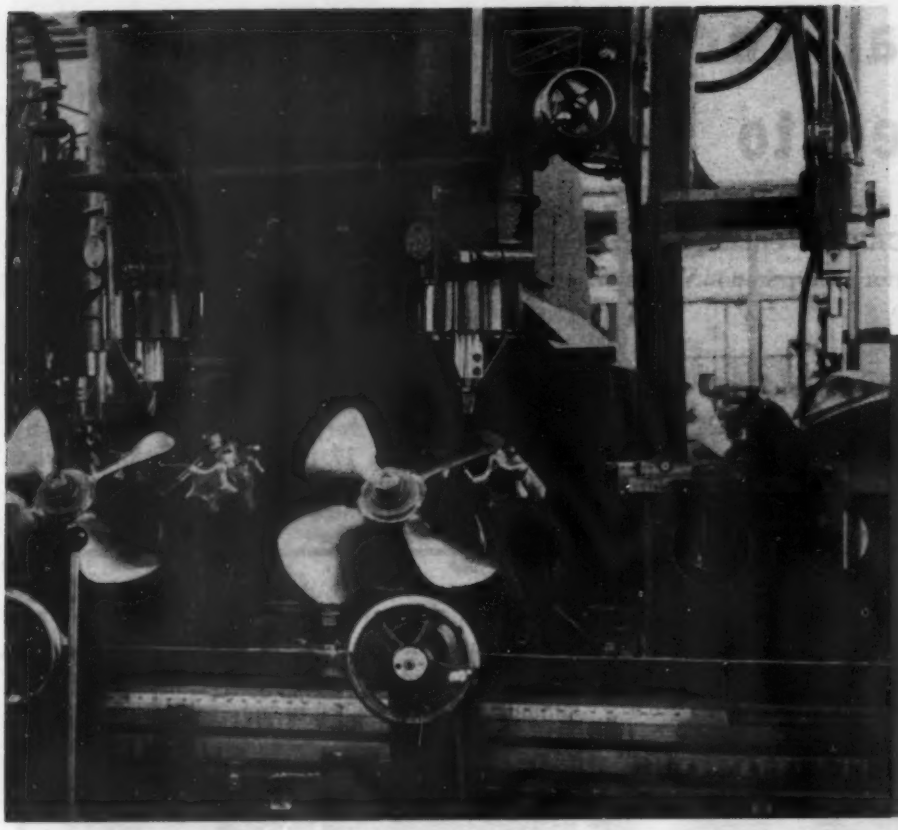
Largest of four torpedo sizes produced by Amertorp weighs 17 lb. and is machined from a 30 lb. steel forging. Propellers are carefully balanced to minimize vibration when in use

TWO CONTRA-OPPOSED forged steel propellers drive each of the naval torpedoes made for the U. S. Navy at the Forest Park Naval Ordnance Plant operated by the Amertorp Corporation, a division of the American Can Company. The largest of the four sizes of propellers made is machined from a forging which weighs 30 lb. when delivered to the machine shop. When ready for assembly on the torpedo, this forging weighs about 17 lb. The average hardness of these forgings is about 255 to 285 Brinell. When finished the blades must be accurately quartered and the pitch contours must be within 0.003 in. of the proper shape as indicated by contour gages. Blade thickness and length dimensions must be held within 0.005 in. In addition, the propeller must be carefully balanced to minimize vibration when in use.

Because some wear is to be expected in the propeller



Propeller hubs are bored and faced in a 36-in. vertical turret lathe before the blades are machined



Cincinnati Hydra-Tel millers are employed for contour milling propeller blades and adjoining hub areas. One blade on each propeller is machined at a time, the piece being indexed between cuts until all four blades have been milled

forging dies, and fins frequently are left on the blade edges, the first machining operation consists of facing the blade edge at the small end of the forged hub in order to provide flat locating surfaces on which the forgings can be placed in the fixture used for boring the hub. This "snagging" operation is performed in a 36-in. Bullard vertical turret lathe with high-speed steel tools.

Before the propeller blades are machined, the hub is rough and finish bored and faced on both ends in a 36-in. Bullard vertical turret lathe. In every case, the hub is taper bored. The largest propeller has a 2⅜-in. long bore which is about 4¼-in. diameter at the large end and 4¼-in. diameter at the small end. The bore must be finished within plus 0.001, minus 0.000 in. on the bore diameters and must be finish faced within plus 0.0100, minus 0.000 in. of the specified lengths. Finished bore and face surfaces must be smooth.

The propeller forging is held in a special fixture on the table of the machine. This fixture is designed to support the blades on both top and bottom surfaces and has four clamps which are tightened carefully to avoid springing the forging. Usually the hub is bored in two operations using a high-speed steel tool for the roughing cut and a Stellite-tipped tool for finish boring. Each of these boring bits has a 90-deg. point angle with a 1/16-in. nose radius. The rough boring bit has a chip curling groove ground in the face along the cutting edge. The finish boring bit has no top or side rake. Rough boring is done at 47 r.p.m., and finish boring is done at 84 r.p.m. During the rough boring cut, a Stellite-tipped tool in the side head of the machine is used to take a turning cut on the outside diameter of the blade to remove excess stock.

Machined propellers are finished by grinding and polishing the blade surfaces and the outside of the hub. All surfaces must be blended smoothly and must be within 0.003 in. of the correct contour

The workers in this group are drilling and tapping propeller hubs for a grease hole, stencilling identifying data, and balancing finished propellers

★

This tool has about 5 to 6 deg. back rake and a ½-in. rise radius. Facing operations also are performed with two cuts, roughing at 47 r.p.m. and finishing at 84 r.p.m. with Stellite-tipped tools. When using carbide-tipped tools, a speed of 84 r.p.m. is used for both roughing and finishing cuts. Feeds for both rough and finish boring and facing cuts usually are about 0.006 in. per rev. The turning tool which takes a cut on the outside diameter of the blade is fed at 0.012 in. per rev. A soluble oil coolant is flooded over the work for all cuts except the finish boring operation. It has been found that a better finish is produced if no coolant is used when finish boring with a Stellite bit.

The finish-bored hub is used to locate the forging for all subsequent machining operations on these propellers. The first of these operations consists of form milling the contour of one side of each of the four blades in a two-spindle Cincinnati Hydro-Tel contour milling machine. Two propeller forgings are machined in each set-up on one of these units. Where the amount of stock to be removed is not more than 0.075 to 0.100 in., only one cut is necessary when contour milling the blades. However, when more stock must be removed, two cuts are taken. The tracer which controls the vertical motion of the spindles on one of these machines follows the form on a solid cast-iron master form block. Usually, a ⅞-in. diameter ball-point follower is used on this tracer arm and ⅞-in. diameter ball-point end mills are used in each spindle. These cutters are two-lip, right-hand helix and right-hand cut mills which are rotated at 200 to 250 r.p.m. The machine table is moved longitudinally 1/32 to 1/16 in. between each cut. Feed is by hand over areas where the cut is heavy, and by machine where the stock is light. Each of the two fixtures holds a propeller so that one blade and hub area is milled at each station. Then the forging is indexed on the fixture to position the next blade. Three jack screws under the blade support it during the cut. Two of these jack screws are spring loaded and are locked individually with hand screws. The other jack screw is adjusted with a wrench. The arm holding these three jack screws is swung out of the way for indexing from one blade to the next. During a cut, the blade opposite the one being machined is supported by another jack screw on the base of the fixture. After the four blades have been contour milled on one side, the propeller forgings are delivered to another Hydro-Tel miller, where the other side of each blade is contour milled in a similar set-up.

A 2-in. diameter and 5½-in. long helical slab mill is used to finish mill the periphery of each blade on a propeller forging in a single-spindle Pratt & Whitney profiler. This operation allows 1/16 in. around the profile for finish grinding the bevel on the leading and trailing edges by hand. The fixture incorporates a heavy plate cam against which is run a roller follower on the end of the cutter spindle. This follower is 1/16 to 3/32 in. larger in diameter than the cutter. The fixture locates and clamps the forging in the hub

bore and has a clamp into which one of the blades is fitted so that the opposite blade can be located for milling. After a blade has been profiled, the propeller is lifted off the fixture and indexed to bring the next blade into position.

Next, the propellers go to a Monarch-Keller lathe for a contour facing cut in which the face on the small end of the hub is blended into the blade contour. A similar cut was taken on the other end of the hub when the propeller forging was set-up in the Bullard vertical turret lathe for boring the hub.

Next, the propellers are delivered to a polishing room where the blade surfaces are ground, filed, burred, and polished to fit contour gages and form blocks. The operators in this room are carefully trained to take a rough-machined propeller forging and perform all of the necessary operations to produce a finish-polished propeller. Each man performs all of the operations on a given propeller, including the roughing of the form with No. 60 grit aluminum-oxide abrasive on semi-hard finish rag wheels with ¼ to ⅜ in. stitches. Finish polishing is done with No. 140 grit aluminum-oxide abrasive on the same type of wheel. Wheel widths vary from 1 to 2 in. Some of the wheels are set up on a radius and some have flat faces, depending on the blade area being polished. It has been found that the best wheel speed is about 1,900 to 2,000 r.p.m. with a 16-in. diameter wheel. During these grinding and polishing operations, approximately 0.020 to 0.025 in. of stock is removed from all surfaces of the propeller, except the finished hub faces and the hub bore. Each propeller is inspected carefully for shape and blade thickness before it leaves this polishing group.

Final operations on a propeller consist of broaching a keyway in the hub with a LaPointe horizontal hydraulic broaching machine, drilling and tapping a grease hole in the hub, engraving identification data on the hub, static balancing and final inspection. For the balancing operation, the propeller is pressed onto an arbor and checked for balance on a Sundstrand static balancing stand. The propeller is brought into balance by touch-up grinding on the back surfaces of the finished blades. At the final inspection bench, the propeller is checked for proper quartering of the blades, and for proper blade contour. A written report is made of the characteristics of each propeller produced at the plant.

Procedures for High-Speed Butt Welding—I

COURTESY, THE LINCOLN ELECTRIC COMPANY

WARTIME experience in ship construction has demonstrated that full-strength arc-weld joints can be made at greater economy by following these principles:

1. Travel as fast as possible within limits of good weld appearance.
2. Use the largest practical electrode.
3. Apply the highest practical current.
4. Use the shortest possible arc, dragging the electrode coating where practical.
5. Employ proper plate preparation and fit-up.
6. Keep build-up to a minimum.
7. Choose the most weldable steel.

In conventional arc welding by hand, the arc simply melts the electrode and parent metal, allowing them to fuse. But the arc has ability to dig, that is, if electrode travel is fast enough to keep ahead of the molten-metal pool, the arc will penetrate into the base metal, often more than 50 percent. Deep penetration is promoted by use of higher than conventional currents, and larger electrodes will be needed to carry them. To avoid loss of arc force, the coating should be kept lightly in contact with the plates.

The procedure tables or high-speed welding, or "Fleet Welding" as it has been termed, give the welding speed in two ways: (1) arc speed in inches per min., for the first pass, and (2) feet of joint welded per hour. The first figure applies only to single-pass welds, or the first pass in multiple-pass welds, since speed is essential here to obtain proper penetration. Arc speed on succeeding passes and the total number will vary with operators.

The electrode is inclined 60 to 80 deg. from horizontal in direction of travel.

Proper fit-up is closely related to maximum welding speed. A gap of 1/16 in. or less is recommended except when the joint must be welded from one side. With a wider gap, deposit one or more seal beads with 3/16 in. electrode. A 1/8 in. shoulder is preferred when making V-butt welds.

Preferred steel analysis for high-speed welding is: 0.13-0.20 percent carbon: 0.40-0.60 percent manganese: 0.10 percent silicon or less; 0.035 percent sulphur or under, 0.04 percent phosphorus, or under. Several base price steels have substantially similar analyses.

ELECTRODES FOR FLAT-POSITION WELDING

PLATE EDGE	Beads or Passes	Electrode*	Polarity
SQUARE	All	E6010	Positive D.C.
SINGLE AND DOUBLE V & U GROOVES	All beads except top or cover passes, seal beads, or 1st pass when steel analysis is not in preferred range	E6020 E6030	Negative D.C. or A.C.
	Top or cover passes	E6030	Negative D.C. or A.C.
	Seal beads for poor fit-up, or first pass on steel not in preferred analysis range	E6010 E6011	Positive D.C. or A.C.

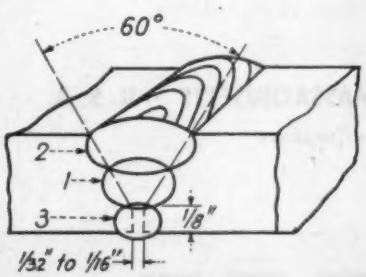
*American Welding Society classification

SQUARE EDGE ➡
Flat Position

Chipping not necessary

Welded from Both Sides

SINGLE V-GROOVE ➡
Flat Position



Welded from Both Sides

Plate Thickness In.	Electrode Size[1]	Current Amps.	Electrode Melt-off[2] In./Min.	Arc Speed In./Min.	Passes or Beads[3]	Ft. of Joint[4] per hr.
3/16	1/4	190	7	18	2	45
1/4	5/16	325	7	18	2	45
5/16	5/16	375	8	18	2	45
3/8	5/16	450	9	18	2	45
1/4	3/16-E6010	220	10½	10	2	27
	3/16-E6011					
5/16	3/16-E6010	220	10½	9	2	25
	3/16-E6011					
3/8	1/4	300	9½		1st	25
		350	11½	8.5	2nd (Back Pass)	
7/16	1/4	350	11½	11	3	23
1/2	1/4	350	11½	10	3	19
5/8	1/4	350	11½	9	1st	13.5
	5/8	450	10¾		2nd & 3rd	
	1/4	350	11½		4th (Back Pass)	
3/4	1/4	350	11½	8	1st	9.8
	5/16	450	10¾		2nd, 3rd & 4th	
	1/4	350	11½		5th (Back Pass)	
1	1/4	350	11½	8	1st	6
	5/16	450	10¾		2nd to 6th	
	1/4	350	11½		7th (Back Pass)	

[1]Except where noted otherwise, electrodes and polarity follow the practice in accompanying table "Electrodes for Flat-Position Welding"
[2]For the first pass.
[3]See table "Electrodes for Flat-Position Welding"
[4]100 percent operating factor.

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from MAKERS *to* USERS *of*
STARRETT TOOLS

Without your alert mechanical minds to plan and organize their work —

Without your skilled hands and keen eyes to make their work constantly effective —

Starrett Precision Measuring Tools could not have made the contribution to the cause of the United Nations for which we, their makers, have worked without stint. Our faith and confidence in your ability to make the most of Starrett Tools is what has kept us everlastingly at the job of turning them out in unprecedented quantities while maintaining Starrett standards of accuracy and dependability.

We knew you wouldn't let us down and we want you to know that the quality and quantity of precision work you have turned out has the sincere admiration and appreciation of those of us who have furnished the tools.

Keep up your fine work until the last gun is fired. We'll keep on doing *our* part of the job to the very limit of our ability.

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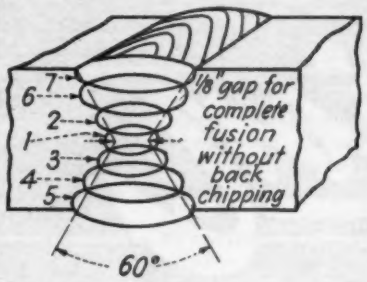
HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

Procedures for High-Speed Butt Welding—II

(To be continued in an early number)

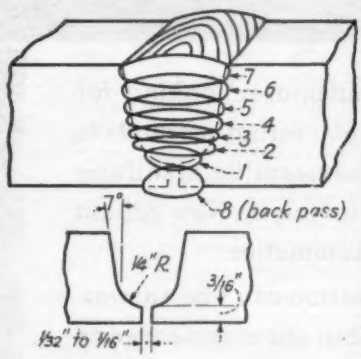
DOUBLE V-GROOVE
Flat Position



Welded from Both Sides

Plate Thickness In.	Electrode Size[1]	Current Amps.	Electrode Melt-off[2] In./Min.	Arc Speed In./Min.	Passes or Beads[3]	Ft. of Joint[4] per hr.
3/4	3/16-E6010 3/16-E6011	150	8	6	1st (Seal Bead)	8.1
	1/4	350	11 1/2		2nd, 3rd, 4th & 5th	
1	3/16-E6010 3/16-E6011	150	8	6	1st (Seal Bead)	
	1/4	350	11 1/2		1st Pass, each side of seal bead	6.4
	5/16	450	10 3/4		Last 2 passes on each side	
1 1/4	3/16-E6010 3/16-E6011	150	8	6	1st (Seal Bead)	
	1/4	350	11 1/2		1st Pass, each side of seal bead	5
	5/16	450	10 3/4		Last 3 passes on each side	
1 1/2	3/16-E6010 3/16-E6011	150	8	6	1st (Seal Bead)	
	1/4	350	11 1/2		1st Pass, each side of seal bead	3.8
	5/16	450	10 3/4		Last 4 or 5 passes on each side	

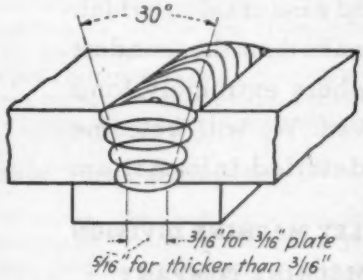
SINGLE AND DOUBLE U-GROOVE
Flat Position



Welded from Both Sides

			Single U-Groove			
3/4	1/4	350	11 1/2	10	6	8.5
1	1/4	350	11 1/2	10	8	5.5
1 1/4	1/4	350	11 1/2	10	10	4.1
1 1/2	1/4	350	11 1/2	10	12	3.2
			Double U-Groove			
3/4	1/4	350	11 1/2	10	4	7.8
1	1/4	350	11 1/2	10	6 or 8	6
1 1/4	1/4	350	11 1/2	10	8 or 10	4.6
1 1/2	1/4	350	11 1/2	10	10 or 12	3.6
1 3/4	1/4	350	11 1/2	10	12 or 14	3
2	1/4	350	11 1/2	10	14 or 16	2.4

SINGLE V-GROOVE
Flat Position



Welded from One Side with Back-up Strip

3/16	3/16	200	10 1/2	6	1	30
	5/16-E6010	425	8 3/4	16	1	80
1/4	1/4	300	9 1/2	10	2	25
	3/8-E6010	500	8	14	1	70
5/16	1/4	300	9 1/2	10	2	21
3/8	1/4	350	11 1/2	10	3	17
7/16	1/4	350	11 1/2	10	3	14.5
1/2	1/4	350	11 1/2	10	4	12
5/8	1/4	350	11 1/2	10	1st & 2nd	
	5/16	450	10 3/4		3rd & 4th	10.5
3/4	1/4	350	11 1/2	10	1st & 2nd	85
	5/16	450	10 3/4		Remainder	
1	1/4	350	11 1/2	10	1st & 2nd	6.4
	5/16	450	10 3/4		Remainder	

[1]Except where noted otherwise electrodes and polarity follow the practice in accompanying table "Electrodes for Flat-Position Welding"
[2]For the first pass.
[3]See table "Electrodes for Flat-Position Welding"
[4]100 percent operating factor.

WHEN does NEW BRITAIN *Production* start to PAY?

● MANY a manufacturer looking for more efficient manufacturing methods is in doubt about the advisability of shifting to high speed production on New Britain Multiple Spindle Automatics.

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THE NEW BRITAIN MACHINE COMPANY
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Gaging Business

Few Reconversion Signs

Thanks to the Byrnes Directive giving the War Manpower Commission final say on reconversion, the Nelson "blue" orders apparently had done little to start resumption of the manufacture of civilian goods. The order permitting the placement of orders for post-war machine tools only resulted in one request for such shipment during the first ten days that forms were available for handling such orders, according to WPB's Tools Division. Morever, there were few signs that important amounts of aluminum and magnesium would be consumed by reconverting plants under existing circumstances.

With respect to machine tools, it is believed that industry may have decided to await further "reconversion" developments before placing new orders. Moreover, considerable uncertainty prevails over the number and type of tools that will be placed on the market by the government.

So far as aluminum and magnesium are concerned, surpluses of both metals are piling up faster than it can be consumed by civilian goods industries. The aluminum stockpile is over 350,000,000 pounds, while the magnesium stock reserve is above 100,000,000 pounds. As a result, it is reported that the "blue" order affecting the two metals may be revoked, and instead all controls over both metals may be removed. The reasoning behind this would be that the huge surpluses and the restricting limitations of the labor supply combine to make possible the meeting of all potential requirements for both metals.

The way things now stand, the major hope for greater reconversion lies in increased cut-backs in military production. It is reported that the volume of slashes in military programs during August will exceed the $215,827,000 in cut-backs handled by the Production Executive Committee from June 15 to July 1st. Two major cuts that will be included in the August volume will be the plane reduction plan and the decrease in the torpedo program. The former will free some 200,000 workers by the year-end, the latter will free over 6,000 workers.

Labor Force Dwindling

However, the unfortunate aspect surrounding the labor involved in program cuts is that many of the released workers later fail to apply for reemployment in the same area. In some cases as few as 25 percent of released workers have been subsequently put to work on other war jobs in the same area. This steady shrinkage in the labor force is said to reflect the fact that many of the temporary workers now in the labor force are beginning to return to their homes and their farms, partly due to the increasingly favorable nature of war news. This promises to delay substantial reconversion, aside from continuing limitations in materials and components.

The Steel Division estimates a 95 percent operating rate for the industry in the fourth quarter. This means an expected output of 21,800,000 tons of steel ingots and castings with a possible yield of 16,100,000 tons of finished products. In contrast to this fourth quarter requirements had been set at 20,000,000 product tons. Since allocations were set at 110 percent of expected output, or 17,700,000 tons, requirements had to be cut by some 2,300,000 tons. However, it is expected that cancellations and cut-backs may ease the fourth quarter situation.

The drive to reduce steel inventories below the 60-day CMP maximum was successful to the extent that it has already resulted in reductions in third quarter orders totaling 200,000 tons. Steel consumers themselves are exercising greater caution over inventories in view of the favorable war outlook.

No More Quota Plans

The automobile industry is continuing conversations with government authorities on reconversion plans. Latest figure on the number of cars that the industry can turn out after the German War is 2,000,000, but no specific industry allocations have been made thus far. As it is, it is reported that the Office of Civilian Requirements has put a "moratorium" on any further industry-wide quota plans such as the one on electric irons. The irregular effects of the "spot authorization" order would militate against further product-by-product plans.

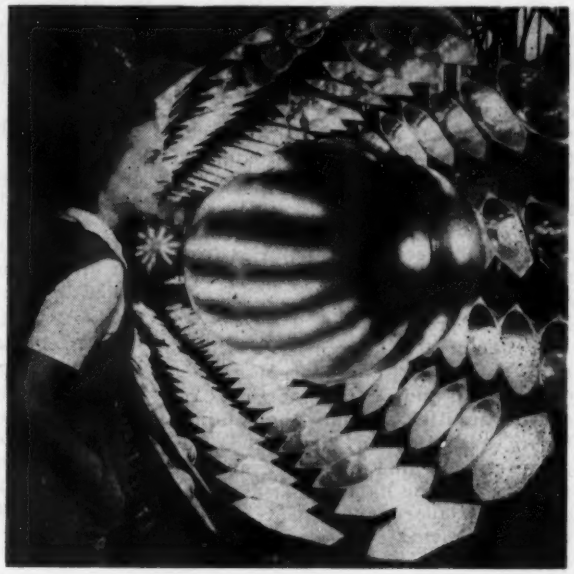
Major bottleneck in the badly needed heavy truck situation is axles, with transmissions rating as the second headache. In recent weeks, producers have asked WPB for 1,100 directives in connection with the truck program.

OPA Worries Industry

OPA pricing policies continue to worry industry. OPA has stated that it will make allowances for increased costs in changing maximum prices. However, the agency's intention to "hold the line" against inflation even after the fall of Germany indicates that profit margin differentials between industries may generally be levelled out as long as such pricing controls are in effect.

Small subcontractors on airplanes may be badly hit by the cut in the plane program, and may press for auto parts work. Since the auto replacement parts program has been fairly well laid down, such parts production would have to be for new cars rather than for replacement purposes. Some observers hold that the granting of some such relief to small subcontractors would help reduce the reconversion period for the automobile industry.

Russian orders for machine tools under the Fourth Protocol are reported to have been relatively small in relation to the over-all $500,000,000 plan. Some inquiries have been circulated by the Mexican Purchasing Commission, which is reported to have better official standing than previously.



Plane Drop Tanks—Like a series of small blimps, freshly painted fighter plane drop tanks are conveyed through a tunnel of infra-red drying lights under the watchful eyes of inspectors at a Los Angeles war plant. Hung from bomb releases on the planes, the tanks are used once, to carry added fuel loads, and are dropped when empty. These tanks give fighter planes a greater flying range

Initial Results of WPB Reconversion Orders Disappointing

Manufacturers are deluged by inquiries, but tight labor situation delays reconversion. WMC may lower employment ceilings of plants producing non-essential goods

CLEVELAND—An indication of the tremendous pent-up demand was the only concrete result in tight labor areas of the orders permitting limited resumption of civilian goods production. Manufacturers of stokers, vacuum cleaners, stoves and other products were swamped by mail, telephone and telegraph with inquiries about when large volume deliveries might be expected. These inquiries covered nearly the full range of the household items which War Production Board Chairman Donald M. Nelson announced could now be made if facilities, manpower and materials were available.

The answers were unvarying. The order was so hedged with restrictions, and the press of war business such that no date could be approximated for additional deliveries of peacetime products.

Conversely, the regional WPB office reported only scattered inquiries from manufacturers interested in the procedure for conversion to some degree of civilian production.

In such critical labor areas as Cleveland, approval of the War Manpower Commission and area Production Urgency Committee also must be obtained before authorization is granted. The prospects for this approval must be appraised in the light of recent action of WMC's labor-management committee in approving a campaign to bring about the transfer of male workers from non-essential industry to plants producing material on the war emergency list.

Foundry Employment Improves

The first priority on manpower referrals, held by forges and foundries, resulted in reversal of a four-month downtrend, although only a one percent increase in foundry employment was registered in Cleveland. Foundry output in the tristate area was held within 3 percent of May figures, despite fears of a summer slump of as much as 20 percent.

Within the last six months, WMC has imported 10,000 workers from surplus labor areas for jobs in foundries and forge shops. This recruiting was aided by guaranteeing workers transfers after 90 days of work, if they wanted them. WMC is combing the same surplus areas for rubber workers, having recruited 1500 in Arkansas, Kentucky and West Virginia.

WMC officials place the overall labor shortage of the area at 50,000, which is expected to be increased by the draft, and the September return to school of pupils and teachers. This labor situation has put half of the area's war plants behind accelerating labor schedules. The region produces 50 percent of all noncombat motor vehicles and 67 percent of all internal combustion engines and accessories. In addition, it makes 58 percent of the combat tanks and parts, 30 percent of the gun mounts, 45 percent of the aircraft propellers and parts.

WMC Blocks Reconversion

WASHINGTON—It was generally believed here that the Byrnes directive giving veto power to the War Manpower Commission over reconversion accounted for the disappointing results from the issuance of Nelson's four orders. It was reported that few manufacturers were taking advantage of the opportunity to place orders for post-war machine tools, and that applications for aluminum and magnesium for use in making civilian products failed to meet expectations.

The War Manpower Commission has asked regional offices to survey their areas and to report immediately the extent by which manpower ceilings can be lowered for companies making non-essential goods. This is believed to indicate an impending order for sharp curtailment in employment at factories now making non-essential civilian goods. Under the circumstances, the prospects of other manufacturers attempting to resume civilian goods production are considered gloomy for several months more, if not longer.

With reconversion delayed, other steps may be taken to reduce the aluminum and magnesium stockpiles. These may include removal of all controls from both metals and further possible reductions in production. The nation's magnesium plants are only at 50 percent of capacity now.

Inquiring Producers Rebuffed

NEW YORK—Initial inquiry by several hundred manufacturers at the regional office of WPB disclosed that little reconversion would be possible for some time. Manufacturers were told it would be some time before favorable decisions on manpower for civilian production could be made, since quotas for the recruitment of labor from this area had to be set first and other manpower data was to be collected and collated.

The general reaction was that the War Manpower Commission will hold back spot authorizations even where labor is available in order to encourage the movement of such workers to more essential production. This general stand is expected to apply to group IV areas, where labor is easy, such as in New York City.

5400 ARMY OFFICERS

WASHINGTON—It is reported that there are 3,000 Army officers doing the paper work for war production in Washington for the various services. There are also 2,400 other officers in the Army Service Forces supervising the work of the other 3,000.

Navy "Sanctions" Break Ban Of Machinists Against Overtime

SAN FRANCISCO — Navy-imposed sanctions against machinists defying Government orders rescinding a union ban against a work week of over 48 hours at five plants seized by the Navy resulted in almost complete worker compliance within a week. The sanctions used included certification of the non-complying workers to State Selective Service headquarters for possible draft, a request to the OPA to cancel supplemental gas rations, and the "blacklisting" of such workers by the War Manpower Commission.

The War Labor Board had originally ordered union, Local 68, International Association of Machinists, AFL, to rescind its ban against a work week of more than 48 hours, affecting over 100 local machine shops. When the union refused, the Navy on August 14th assumed control of five of the more prominent plants here, including Federal Mogul Corp., Pacific Gear & Tool Works, Link-Belt Co. (Pacific Division), U. S. Pipe & Manufacturing Co., and Enterprise Engine & Foundry Co.

When strikes and work stoppages continued over union efforts to have complying workers fired, the Navy applied its "sanctions." A week later there was 100 percent compliance at all five plants, except for some few machinists at the Federal-Mogul Corp.

After the Navy had seized the 99 other plants where overtime was banned by the machinists, the union announced that members could work as many hours as they liked.

Inside Detroit

BY SILER FREEMAN

Feel Reconversion Lagging

The trend of the war is making some of the motor magnates wonder if they will be far less prepared for peace than they were for war. With all of Congress' shadow-boxing on the various reconversion bills, things legislative are moving much too slowly for the planning of the auto industry.

Cutbacks and cancellations are on the increase and no progress is being made on giving specific authority which will clear the plants quickly. From the examples already on hand, they see their floor space tied up endlessly unless this authority is conferred.

Right now, the auto executives complain, nobody wants to make a decision on what to do with the pile of materials laying around. All are afraid of future criticism if they make the wrong decision and the one big flareup that came from the sudden sale of surplus tools by the Army Air Forces more than a year ago still reminds them that to move too fast may mean an official reprimand.

RFC Getting Surpluses

The mounting pile of surplus materials is causing the regional WPB chiefs here some concern. They have found a big loophole in the present laws on that subject. This they are trying to plug with a bit of sub-rosa work in Washington. So far no results.

The loophole is this: When materials become surplus, the services are supposed to try to sell them to private buyers before sending them to the RFC. But a little quirk in the interpretation makes it possible to send them directly to the latter agency without offering them for sale. This the services have found is much easier than going through the red tape of private sales.

This means that surplus materials are stockpiled and must be moved two or three times. The fear is that this easy means of turning the surplus over to RFC will mean that the goods will eventually land in the hands of sharp-shooters.

Machine Tool Mix-up

One of the biggest complaints of the auto manufacturers against the services today concerns machine tools. Many manufacturers have their own tools in the production lines. When they first entered war work, through sheer necessity they converted their general purpose tools to the business of making arms and were glad to do it.

Since then the situation has changed somewhat. The services have been getting many of the general purpose tools, which they themselves had built, back from the plants which have been cut back or closed entirely. The manufacturers claim that their warehouses bulge with tools which could do the same work that the private machine tools are doing.

With the government tools standing idle, the manufacturers have asked to withdraw their own for reconditioning purposes and the substitution of the government tools. But the services have almost consistently turned down these requests. One of the reasons given is that some of their tools are new and by putting them into production lines, they would have to sell them later as used.

But the auto officials charge that the services are "hoarding" and should allow them to prepare for reconversion by taking their tools out of war production and getting them ready. The fight will undoubtedly go down to Washington too.

Merger Talk Continues

Talk of mergers in the automotive industry goes on endlessly. The withdrawal of the Fisher Brothers from General Motors fed the rumors but their failure to announce any plans as yet has put a damper on these reports.

Joseph W. Frazer's purchase of the Graham-Paige control, with the aid of Floyd Odlum and two of his Atlas Corp. staff, was linked for a while as part of the "big plan" to organize the small independents into a rival to the "Big Three." But Frazer himself vigorously denied that there was Fisher money in the Graham deal or that he and his associates contemplated any more mergers—at least for the present.

The Fishers themselves have insisted that they do not know exactly what they are going to do. This was poohpoohed at first but now the feeling is gaining that they did not leave GM with their blueprints in shape for another venture. Nevertheless the most popular question today when industry leaders gather is: "What are the Fishers going to do?"

Kaiser Still in Picture

It was not so long ago that the big question mark in the industry was "What's Kaiser going to do?" The shipping magnate was dashing in and out of town, conferring with designers and engineers and letting out hints that he was about to jump into competition. Then he moved his staff to Butler, Pa., and everyone marked him off the future book.

Now comes word to one of his close friends in Detroit direct from Kaiser: "Don't count me out yet."

Kaiser is now engaged in a legal tilt with his former designers and engineers, Probst and Harges. He seeks to get back some plans which they drew for him. Karl Probst is now with Chrysler, his old company, and seems to have lost all desire to aid Kaiser in the "car of the future."

Battling the Truck Bottleneck—This new transmission assembly line at the Lansing, Michigan, plant of Reo Motors, Inc., is only part of the 230,000 square feet of floor space converted to the manufacture of axles and transmissions in four months' time. Transmission covers and shift rods are being assembled here and tried out for proper action. Conversion necessitated installation of new machines, new conveyor lines, and the revamping of heat-treating equipment

AAF Worried by Labor's Cut-back "Jitters," Lagging Termination

Termination problem discussions reveal rising quit-rate at aircraft factories. AAF asks for speedier termination settlements. Four billions in claims still outstanding

NEW YORK—Military authorities will try to avoid a repetition of the Brewster situation in any further cut-backs in order to help curb postwar jitters now being experienced by many war workers. This was brought out during discussions of termination problems and procedures at the August 16 meeting of AAF officers with the War Production Council of the East Coast, Inc., N. Y. It was revealed that quits at aircraft plants have reached alarming proportions, and may have exceeded absenteeism in its adverse effects upon war production a year ago.

Nominally Wright Field is set up to notify district offices 48 hours in advance of a termination, and the local office can apprise management and labor leaders so that the workers can be informed before the cut-backs are made public. Part of the difficulty is said to arise from leaks of information which gain wide circulation. Moreover, news of military successes accentuates the problem of keeping people on the job. Everyone knows that much production will be terminated once Germany falls, so that incentives must be created to keep workers on jobs that will be vital for the duration.

It is believed that some of the difficulty might be avoided if there were greater military frankness about production schedules and their duration. For example few workers know that airplane cutbacks so far only amount to 1644 planes from the 100,000 planes originally scheduled for 1944. Output is currently running at the rate of $75,000,000 daily.

Besides demanding sustained production from aircraft producers, Army Air Forces is asking for greater attention to contracts terminated but unsettled. Management asks, "Which do you want?" Air Forces says, "We must have both." The reason is not hard to find. While there have been 6000 terminations of aircraft contracts since July, 1942, and 4000 of them have been settled, the 2000 contracts outstanding involve $4 billions in claims, or two-thirds of the total amount.

Termination Scrap at 85 Percent

In connection with disposal of termination inventories, high-ranking officers have concluded that about 85 percent of work in process is scrap once a program is shifted. It is difficult to realize the original value of this material, since it is essentially of a far higher grade than required in commercial production.

It is more difficult to dispose of surplus items farther advanced along the manufacturing process. A finished piston costing $70 would only be worth a few cents as scrap, and contractors and government officers hesitate to scrap it. However, the size of the Air Force Program (30 percent of total military outlays) and the possible huge piles of scrap that may be on hand at the end of the war is spurring a plan to list items that may be scrapped by contractors to aid the normal flow of materials.

WAR-DAMAGED TANKS REPAIRED

BERWICK—The War Department has returned 550 light combat tanks from the battlefronts to the American Car and Foundry Company's Berwick plant for repairs. The Berwick plant completed a 15,224 light tank contract on April 17, 1944, thus finishing a job begun in 1939. Right now the plant is engaged primarily in building bulldozers.

Non-War Foreign Business Not Included In Reconversion Plans

WASHINGTON—Foreign trade observers here are worried by the failure of reconversion and military plans to include international trade considerations even at this late date. It is reported that the Foreign Economic Administration may try to get some consideration in the reconversion planning to the extent that some provision be made to allow for filling some foreign orders during the reconversion period in order to hold on to the foreign business now on hand. FEA fears that if some delivery promise or indication cannot be given now to potential Latin-American buyers, then they may very logically turn to other nations to supply their needs.

An example of the predicament of foreign business is the experience of a producer of textile machinery with a normal annual sale of $12,000,000 worth of machinery. This company has about $30,000,000 in firm foreign orders, plus an additional $30,000,000 in letters of intent and firm inquiries. It would be a hopeless task for this company to try to fill these orders plus any other domestic and foreign business that may come in over the next few years. FEA says that this is a case where the government might be interested in promoting sub-contracting to help break bottlenecks.

FEA has had presented to it the engineering plans of a number of DPC-owned plants to be offered to foreign purchasers. The plans are marked "Confidential" and cannot be publicized, but the idea is that specific inquiries may be lined up with specific properties.

Some foreign trade observers believe that a great deal of uncertainty over some surplus plants could be eliminated if the government helped American industry to buy such plants by enabling them to sell their old plants abroad. As an example, steel plants now at the sites of integrated plants cannot be taken over by steel companies unless they are prepared to write off the cost of existing older plants, not fully depreciated. On the other hand, if the government through FEA or some other agency arranged a three-sided deal whereby a steel company could sell its older plant abroad and then apply the proceeds against the price of the new government-owned plant on his property, then all parties would benefit.

Shipyard Output Increased One-Sixth by Shift Change

LOS ANGELES—To help overcome its labor shortage in the face of military pressure for early delivery of 30 troop transports, California Shipbuilding Corp. has given up three-shift operation in favor of two nine-hour shifts, six days a week. The management believes this will result in better utilization of labor to the extent that the longer work week will increase output by 17½ percent and permit delivery of four extra ships before a certain deadline. The added hours will mean an increase of over 20 percent in take home pay for most of the yard's workers. The workers on the small graveyard shift, only 20 percent of the total work force, were assigned to the other shifts.

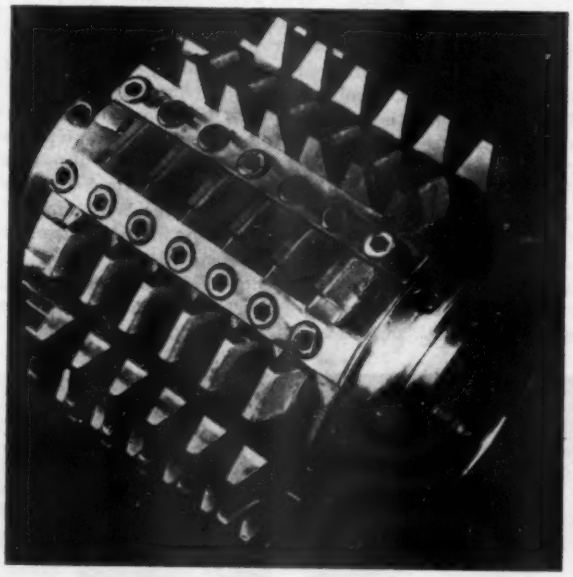
Meanwhile, local results of the national drive for more workers for foundries and forging shops have been negligible. Less than 1,000 men are needed for such work in Los Angeles County, yet the need is so vital that it is reported to be holding up production of B-29 bomber parts. One plant is 45 days behind scredule on production of a certain part.

Wartime Washington

Somervell Has His Day

The Army-WPB battle over reconversion, culminating in the Byrnes Directive which gave the War Manpower Commission veto power over reconversion left the reconversion situation so clouded that WPB Chief Donald Nelson was virtually forced to make some statement on reconversion. At a large press conference, Nelson ate humble pie, admitted that his "blue" orders as they now stood, would result in very little reconversion. He said the purpose of the orders was to "get ready" for reconversion after the European War.

Then diverting attention from this rather discouraging prospect, Nelson pointed out that end of the German War would cut war production 40 percent, and if this were directly translated into civilian production (a highly impossible hypothesis), then 1939 production levels of civilian goods would be possible.



Hobbing Innovation—The use of cemented carbide strips for the cutting edges of a hob body in Navy tests at the Joshua Hendy Iron Works, Sunnyvale, Cal., permitted roughing cuts in climb hobbing at 100 rpm instead of 35 rpm spindle speeds obtainable with standard high-speed steel hobs. The new composite five-pitch, single thread hob with strip teeth, shown here, has eleven rows of six teeth each

Nelson's Aces

But in deferring to military pressure, Nelson had two aces up his sleeve: (1) knowledge of impending large cutbacks which would more than wipe out the manpower shortage; and (2) realization that the Army's huge munitions stockpiles had been called to congressional attention so that congressional pressure might force some curtailment of military requirements.

One cutback Nelson knew about was the gradual plane cut, expected to free at least 200,000 workers by the end of the year, and 294,000 by mid-year 1945. Cuts of varying sizes were slated for the P-47's, P-63's, C-46's, P-61's, and B-24's. Since the current labor shortage amounts to 200,000 workers, this cut alone would numerically balance labor requirements, although differences in areas and skills involved would still leave some spot shortages. Another reduction was that in the torpedo program affecting over 6,000 workers.

The threatened resignation of two WPB statisticians over the Army's attempted suppression of military stockpile figures was enough to gain the attention of the Senate War Investigating Committee, formerly the Truman Committee. Preliminary hearings resulted in a statement that "specialized shortages exist in the *war supply program*, but there is no shortage at the *battlefronts*." This conclusion is radically different from General Somervell's contentions of serious battlefront consequences if some shortages were not eased. Moreover, the Committee apparently concluded that the Army had overbought on some items and that some program reductions seemed appropriate.

Reconversion is Delayed

The net result of this cross-current of maneuvering was a clean-cut victory for Nelson. But it would take some time to translate this turn-about into actual material benefits for industries trying to reconvert. First of all, there must be enough labor released from cutbacks to undermine WMC's veto power over reconversion on the grounds of labor shortages. However, findings of the Senate War Investigating Committee may spur the volume of war production slashes, despite some fears that such reductions may be deferred until after election day.

Amazed at their findings in examining reports of military stockpiles, the Senate committee seems bent on uncovering any surpluses, and placing the blame for any evidences of bungling.

Senate Investigates Stocks

The committee is expected to move along to government stockpiles of various metals. Some interesting revelations are expected in some stocks of nonferrous metals, such as zinc and lead. Despite large federal zinc stocks, bought partly at premium prices, the government is still paying bonuses over the ceiling prices for some zinc production. Inquiries may also be made into the huge stockpile of lead ore and concentrates stored in Mexico until recently.

Observers with a knowledge of ferro-alloys believe that stockpiles of such items are very sound, and, if anything, on the low side. This has been the result of a flexible and realistic accumulation policy combined with national conservation measures which helped to remove all ferro-alloys from the category of "bottleneck items."

Surplus war property legislation has advanced to the point that two parallel measures, one the Colmer Bill in the House, and the other the Murray-Stewart Bill in the Senate, are being amended. One amendment to the House measure would provide for industry committees to aid the liquidation job. Major point of difference between both bills is that the House bill provides for a single administrator, whereas the Senate bill will provide for an eight-man board to direct the $100,000,000 surplus disposal job.

The George Demobilization Bill stands favorable chances for passage in the House, except for some scattered opposition by so-called liberal congressmen who will press for higher worker unemployment benefits. Thus far, no proponents of higher unemployment pay, such as was embodied in the defeated Murray-Kilgore measure, have come forth with plans on how such billions in Federal funds would be raised.

NELSON'S REWARD: CHINA

WASHINGTON—President Roosevelt's dispatching of Donald M. Nelson, WPB Chief, on a special mission to China immediately after having won his first clear-cut victory over the military, led to speculation here that this represented a set-back for him and his reconversion plans.

Spotting the Air News

Cutback Mostly Paper Work

The big news on cutting aircraft production goals 15,000 units was just a piece of paper work, reducing quotas to actual production. Airframe weight production remains at 100,000,000 pounds per month until Germany folds up. Output for this year (providing Germany stays in the war) will be just over 100,000 units, as was expected, and the monthly rate for the rest of this year will be a little higher than it has been. Planes in five of the nine categories will be delivered in greater quantities next year than this year, and one new category will be brought into production.

Many people in WPB and elsewhere think the Washington announcement of the cutback was a mistake. The publicity caused a run of "deserters" from plant ranks, particularly women who picked up and went home, convinced the emergency had ended. What WPB could have done instead is not easy to say. Some plants, like Higgins, Consolidated, and others got actual cutbacks and there is no way to keep workers, union leaders, local papers from knowing it.

When Germany quits, the curtailment of airplane schedules will be a big one—perhaps 30 to 50 percent. But in that case, the cutback may be its own remedy against worker "quits." A lot of workers will go home, but they won't be needed anyway.

Jap Air Force Weakened

Very little is heard, lately, of the Japanese air forces; they rarely show up for a fight, and most Jap defense against American aviation is anti-aircraft fire. Admiral Nimitz recently implied that the Jap navy's air arm had been all but destroyed at Saipan, where the biggest air battle in history took place. More than 400 Japanese planes were shot down in the afternoon, many others went into the sea short of fuel, and were otherwise lost. Some observers believe that the Jap army has an inferior but large air force waiting for the Americans to come within range. Regardless of enemy air power, the United States will need all the airplanes they can support in the Pacific—to bomb factories, to sink ships, defend bases and to strafe and bomb from low levels.

Post-War Aircraft Plans

Government-owned aircraft plants, in areas that have never been centers of metal working before, should be transferred to peacetime operations, Charles E. Wilson, chairman of the Aircraft Production Board, told the Murray War Contracts Subcommittee of the Senate. He mentioned such places as Fort Worth, Wichita, and Atlanta. Wilson said Army and Navy would want to lease some of the plants to responsible private enterprises. Their operation in peace production would hold intact the metal-working know-how on the part of management and labor which would be desirable in case of war. Such a program would require credit arrangements, transportation, materials supplies—and much else beyond the scope of WPB. Undoubtedly, the military will want to keep some of the plants partly or wholly in war plane production, Wilson said. He implied that transfer of major aircraft industries from the coasts inland (farther from attack) would be impractical.

AIR FREIGHT REQUIRES MANY PLANES

LOS ANGELES—An indication of the huge number of planes that will be required to transport any large part of the nation's freight by air in the post-war period was given recently by Robert E. Caskey, United Air Lines. He estimated it would require a fleet of 260 Douglas DC-4's to fly 2 percent of the West's crop of perishable farm products. He predicted that a survey by Air Cargo, Inc., would be in the hands of airline operators this fall, indicating that discussion on air freight are no longer "in the dark."

AAF Says Plane Cuts Will Not Affect West Coast Plants

LOS ANGELES—Cutbacks ordered by the War Department on August 10, of Liberator bombers, Commando transports, and Thunderbolt fighters, will have no effect on the 12 aircraft factories of the Pacific Coast, according to Brigadier General Donald F. Stace, commanding the Western District, AAF Materiel Command.

"We need every airplane that can be produced by Pacific Coast plants," said Stace, "and our schedules, projected into the future, call for 100% utilization of their production facilities."

Harry H. Woodhead, president of Consolidated Vultee Aircraft Corporation, builders of the Liberator bomber, said that production of this airplane had been curtailed at the company's San Diego plant some time ago, in favor of the longer range B-32 bomber. "We are still facing a shortage of workers," Woodhead said.

Other Pacific Coast companies are not making the models included in the cutback order.

75th Anniversary—B. B. Quillen, president, Cincinnati Planer Co., and A. H. Tuechter, president, Cincinnati Bickford Tool Co., were feted on August 12th at a 75th birthday dinner sponsored by dealers and representatives of both companies, who presented plaques to the two industry executives. Both men have given over half a century of service each to the machine tool industry. Mr. Quillen became 75 on August 1st, while Mr. Tuechter's birthday was August 15th. This view of the Speaker's Table shows from left to right: Tom Rudel, Rudel Machinery Co., N. Y.; J. R. Porter, Marshall & Huschart Machinery Co., Chicago; August H. Tuechter; Bertram B. Quillen; Cincinnati's Mayor James G. Stewart; and A. B. Einig, Motch & Merryweather Machinery Co., Cleveland

Canada May Get $100,000,000 In Russian Post-War Orders

OTTAWA—Two or three of Canada's largest electric equipment companies will split a post-war order running to around $100,000,000 if negotiations now under way with Moscow materialize into actual business.

Representatives of the Soviet government have been making approaches in Canada for electric equipment for some months for reconstruction of power works destroyed by the Russians in their parched earth policy adopted after the German invasion.

Whether the order comes to Canada appears to depend on the amount of credit the Ottawa government is prepared to extend to the Soviet. At the parliamentary session just closed a bill was passed authorizing loans and guarantees to other countries for the buying in Canada. The overall risk to be assumed at any one time was limited to $300,000,000. It is not believed Ottawa would be prepared to place a third of the risk in one country.

Canadian General Electric, Canadian Westinghouse and English Electric Company of Canada are understood to be the companies which would get the bulk of the order, which would involve some subcontracting.

Post-war plans of Canadian Vickers Limited, Montreal, which has carried out some of Canada's biggest war munitions orders and has developed extensively in shipbuilding, are expected to be extended as a result of the purchase by Canadian interests of a large block of the company's stock held by Losanac Limited for the Solvay interests of Europe.

Other Foreign Orders

Vickers, which recently obtained a contract from Brazil for construction of several cargo vessels, will probably share in a projected order for 30 such vessels for the Netherlands government if it goes through. The Dutch have been negotiating with Canadian interests on the basis of prices below those which could be obtained from United States shipyards. The vessels are for post-war service in the East Indies.

Competitive bidding and profiteering on Canada's surplus war supplies will be avoided under a system of disposal now being put into operation by War Assets Corp., government-owned agency which has charge of disposal. The corporation determines, after consultation with manufacturers and dealers, what prices should be charged to the trade for articles so that they may be overhauled and refitted by dealers and sold to consumers at price control ceilings. On goods for which there is keen demand, such as motor trucks, prospective buyers are given priority ratings.

Names in the News

V. A. Armstrong

O. M. Arnold

V. A. Armstrong has joined the Cone Automatic Machine Co., Windsor, Vt. Mr. Armstrong, as a lieutenant colonel in the Army, was connected with the Machine Tool Section of the Army & Navy Munitions Board for four and one-half years first as executive officer and later as section chief.

Orlan M. Arnold, formerly a professor of chemistry at Rennselaer Polytechnic Institute, has been employed by Chrysler Corporation's engineering division to set up a new special laboratory to be devoted to physical-chemistry research. Dr. Arnold will devote himself to experiments with the molecular structure of oil, paint and plastics and the refinement of insulation material and textiles.

Arthur G. Green has been named sales manager of the Bay State Abrahive Products Co., Westboro, Mass. Mr. Green has served with the Norton Co. for the past 28 years in numerous sales capacities.

Ralph W. Hisey, vice president since 1935 of the Osborn Manufacturing Co., Cleveland, Ohio, has been placed in charge of all manufacturing and engineering of both the brush and machine divisions of the compay. At the same time, **Hugh M. Little,** who was formerly associated with the Ohio Crankshaft Co. and the American Bantam Car Co., has been appointed works manager of both divisions.

Edward G. Hardig has been named vice president in charge of sales and a director of the National Tool Co., Cleveland. Mr. Hardig, formerly sales manager for the company, had previously represented the company in the Detroit district. At the same time, **Douglas C. Albright** was appointed vice president and assistant to the president. Formerly an industrial engineer with A. J. Brandt Co., Mr. Albright had previously had 23 years experience in automotive and aircraft industries.

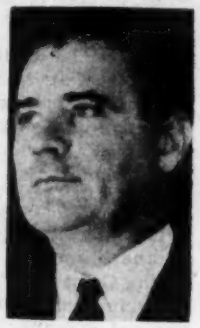
Frederick G. Dawson, formerly general manager of the Pratt & Whitney Div. of Mo., was named executive assistant at the Sikorsky Aircraft Div. of the parent company, United Aircraft Corp. Mr. Dawson has been with United Aircraft for 15 years.

Maurice H. Hobbs has been named manager of the engineering department of the switchgear and control division of Westinghouse Electric & Mfg. Co., while **Charles P. West** has been appointed manager of switchboard engineering and **Wilbur C. Fulton,** section engineer in switchboard engineering.

A. J. Hanlon, recently retired manager of the production department of the International Nickel Co., has been appointed production manager of the Harvill Corp., Los Angeles, Calif.

A. M. Smith has been named production manager of Kobe, Inc., Huntington Park, Calif. in charge of all manufacturing activities of the company.

Meriman Photo
A. M. Smith



A. J. Hanlon

Joseph S. Bennett, former manager of sales of the American Engineering Co., Philadelphia, Pa., has been elected vice president of the concern. Mr. Bennett has been connected with the firm in sales and engineering capacities for several years.

C. W. Perelle has been named an official of the Hughes Tool Co. with headquarters in Houston, Tex. Mr. Perelle recently resigned as vice president in charge of manufacturing of the Consolidated Vultee Aircraft Corp.

Fred R. Cooper has been appointed a member of the executive staff of the Warren City Manufacturing Co. Mr. Cooper has been with Chrysler Corp. for over 20 years and was formerly assistant to the president of Willys-Overland.

James L. Straight has been appointed manager of the Los Angeles office of the Aircraft Manufacturer's Council and its parent organization, the Aeronautical Chamber of Commerce.

William O. Anderson has been appointed assistant to general superintendent in Carnegie-Illinois Steel Corporation's Youngstown, Ohio, district.

C. W. LaPierre, formerly in charge of the electro-mechanical sections of the General Electric Co. engineering laboratory, has been named assistant engineer.

Byne P. Waters has been promoted from general secretary to the president to secretary of manufacturing of International Business Machines Corp., Endicott, N. Y.

Harold W. Schaefer has been appointed assistant manager of the newly-formed radio receiver division of Westinghouse Electric & Mfg. Co., and will be in charge of the division's engineering and production activities.

J. J. I. Jamieson, formerly central district sales manager of the Steel and Tubes Div. of Republic Steel Corp., Cleveland, has been named manager of sales of the mechanical division.

Robert L. Irvin has been named works manager of the Graham plant of the Pittsburgh Screw and Bolt Corp., while **George H. Lee, Sr.,** former works manager, will devote his time to experimental and advisory work.

L. F. Weyand, general sales manager of the Minnesota Mining & Manufacturing Company's adhesive and coating division since 1936, has been named general manager of the company.

OBITUARIES

Harry S. Wherrett, 68, died Aug. 13 after a brief illness. Mr. Wherrett had been associated with the Pittsburgh Plate Glass Co. for more than 53 years and at the time of his death he was chairman of the board. He was also a director of several other companies including Westinghouse Electric & Mfg. Co. and the Westinghouse International Co.

J. A. Schermerhorn, 37-year-old works manager of the American Welding Co., Carbondale, Pa., passed away at his home Aug. 3. Mr. Schermerhorn had been with the American Welding Co. for over 15 years.

F. C. Kroeger

Frederick C. Kroeger, 56, vice president of General Motors Corp. and general manager of the Indianapolis Allison Div., died Aug. 10 at his home in Indianapolis. He was named general manager of the Allison plant in the latter part of 1940 and was elected vice president of General Motors soon afterwards. He was previously manager of the Delco-Remy plant of General Motors, Anderson, Ind.

BUSINESS ITEMS

H. K. Porter Co., Inc., Pittsburgh, Pa., has purchased the **Fort Pitt Steel Casting Co.,** McKeesport, Pa., which will continue under the managership of **Fred Grotts.**

Borg-Warner Corp. has announced the change in name of the **McCullouch Engineering Corp. Div., Borg-Warner** to **B-W Superchargers, Inc.** The plant of the B-W Superchargers is located at 3420 W. Capitol Dr., Milwaukee 9, Wis.

Hufford Machine Works, Inc., Redondo Beach, Calif., has appointed the **Moore Machinery Co.** as the exclusive Calif., Ariz. and Nev. distributor for the Hufford hydraulic stretch-forming machine and the Hufford portable hydraulic elevator.

United States Steel Products Co. has acquired the manufacturing assets of the **Bennett Manufacturing Co.** with plants in Chicago, Ill., and New Orleans, La.

Wyckoff Steel Co. will acquire on Sept. 1 the properties of the **Empire Finished Steel Corp.** located at Newark, N. J., and Putnam, Conn. The Newark property will be operated as the Empire Works, while the Putnam property will be the New England Works.

The Warren Refining and Chemical Co. has opened a new general office at 308 Euclid Ave., Cleveland 14, Ohio.

Food Machinery Corp. opened a new engineering office recently at 3275 Wilshire Blvd., Los Angeles, Calif.

The Phillips Mine and Mill Supply Co., Pittsburgh, have been appointed district sales representatives for the **Hyster Lift Truck Co.** of Portland Ore., and Peoria, Ill.

John R. Cassell Co., Inc., has renovated a building at 138 E. 47th St., New York, N. Y., where both the plant and retail store of the firm is located.

The Anderson Machine Tool Co., 2645 University Ave., St. Paul 4, Minn., has been named a special distributor of Tocco process induction equipment made by the **Ohio Crankshaft Co.,** Cleveland, Ohio.

Milwaukee Industrial Designers have moved to the Commerce Bldg., 744 No. 4th St., Milwaukee 3, Wis. **Roy Siren** will be in charge of the engineering department.

Sutton Tool Co. of Detroit has moved the company's offices and entire manufacturing plant to Sturgis, Mich.

MEETINGS

American Gear Manufacturers Association. Semi-annual meeting. Edgewater Beach Hotel. Chicago Ill. Oct. 30-Nov. 1.

American Society for Metals. Annual meeting. Hotel Statler. Cleveland, Ohio. Oct. 16-20.

Amrican Society of Tool Engineers. Semi-annual meeting. Hotel Syracuse Syracuse, N. Y. Oct. 12-14.

American Welding Society. Annual meeting. Hotel Cleveland, Cleveland, Ohio. Oct. 16-19.

Association of Electronic Parts and Equipment Manufacturers. Electronic Parts and Equipment Industry Conference. Stevens Hotel. Chicago, Ill. Oct. 19-21.

National Electronic Conference. Medinah Club of Chicago. Chicago, Ill. Oct. 5-7.

National Metal Congress. National Metal Exposition. Public Auditorium. Cleveland, Ohio. Oct. 16-20.

National Safety Council. National Safety Congress. Sherman & LaSalle Hotels. Chicago, Ill. Oct. 3-5.

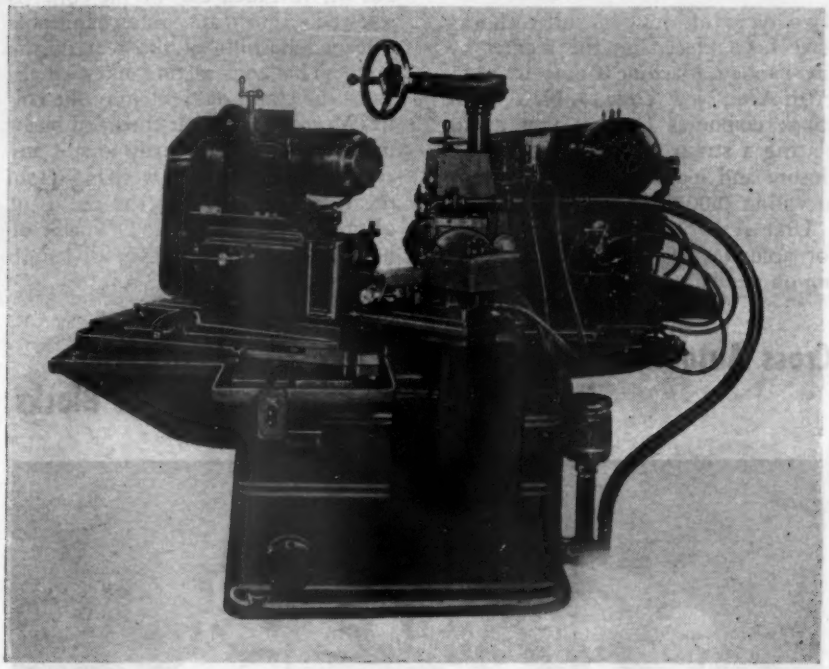
National Tool & Die Manufacturer's Association. Statler Hotel. Buffalo, N. Y. Sept. 21-23.

Society of Automotive Engineers. National Aircraft Engineering and Production Meeting. Hotel Biltmore. Los Angeles, Calif. Oct. 5-7.

Society of Automotive Engineers. National Tractor Meeting. Schroeder Hotel. Milwaukee, Wis. Sept. 13-15.

Shop Equipment News

Fitchburg Company Introduces a Completely Automatic Roller Bearing Race Grinder With Single Wheelhead Unit

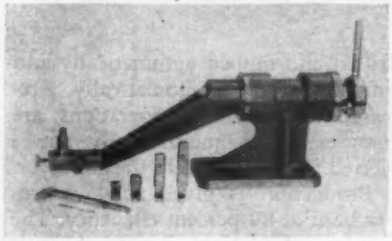


Fitchburg roller bearing race grinder

A new roller bearing race grinder employing a single standard bowgage grinding wheelhead unit is being introduced by Fitchburg Grinding Machine Corporation, Fitchburg, Mass.

The workhead is adjustable from 0 to 65 deg., so the machine can be used for many other straight or taper grinding jobs; it can be arranged either hydraulically or pneumatically for collet clamping or other chucking devices. Completely automatic, pressing a single button sends the wheelhead through its standard automatic cycle or rapid traverse to work, proper grinding feed, spark-out time and rapid return. Work is held to limits of 0.0002 in. in production.

In this taper grinding application, the wheelhead is mounted in a 45 deg. slide for trueing. The trueing device is mounted on the side of the base parallel to the wheelhead, and is hydraulically operated, with micrometer adjustment for positioning.



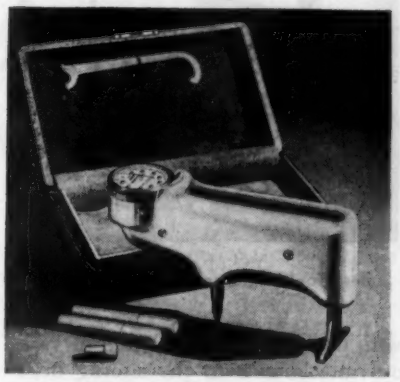
U. S. Tool radius dresser

U. S. Radius Dresser Adapted To Wide Range of Wheel Sizes

Model 45 precision radius dresser, adaptable to a wide range of wheel sizes, has been developed by the U.S. Tool & Mfg. Co., 6906 Kingsley, Dearborn, Mich. This 58 lb. dresser is furnished with three different length diamond holder bushings to assure ample support for the diamonds, providing against chatter when large or small radii are being formed. Careful balancing and Timken taper bearings have been used as precautionary measures to eliminate vibrations.

Built entirely of cast iron, all the unpainted exposed surfaces are chrome plated while the spindle is sealed against abrasive dust with leather "closure seals."

Graduations, plainly etched on a chrome plated metal ring and a lockstop on the spindle enable the worker to obtain the exact radius desired on the wheel being dressed.



Barber-Colman impressor

Barber-Colman Impressor is Made for Non-Ferrous Metals

Barber-Colman Company, Rockford, Ill., is producing the Barcol Impressor, a quick check portable hardness tester for aluminum, aluminum alloys, soft metals and plastics.

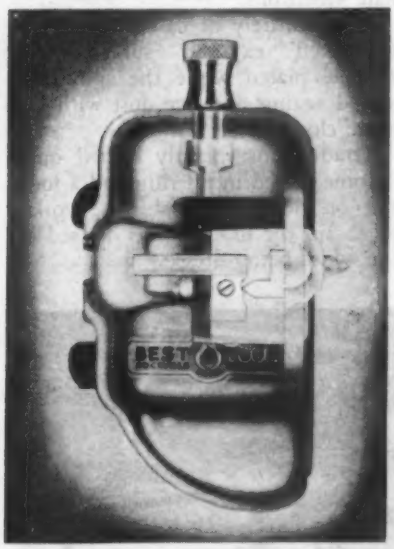
The instrument has been designed for use on fabricated parts and assemblies as well as in raw stocks. It is said to be easy to use as it is only necessary to exert a slight pressure against the instrument to drive the spring loaded indentor into the material to be tested.

The instrument can be used in any space sufficient for the operator's hand. The comparative hardness reading is instantly indicated on the dial which is conveniently divided into one hundred graduations. Readings can be converted to Rockwell, Brinell and Vickers numbers.

Best Tool Abrasive Wheel For Dressing To Any Contour

A new precision tool that makes it possible for an operator of limited experience to dress abrasive wheels accurately to any contour has been developed by Best Tools Corp., Rockville Centre, L. I., N. Y. The main features of this tool, according to the manufacturer, are simplicity of design, ease and speed with which an untrained worker can handle it.

Radius and angle dressing can be accomplished with this same tool with flexibility, accuracy and speed and,



Best Tool angle and contour dresser

with the proper transposition of various attachments to the sliding head casing, several hitherto unobainable shapes can be obtained and duplicated easily.

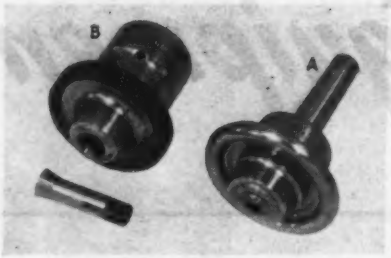
Although it is seldom necessary to clean the dresser, as it is designed to keep all moving parts free from grit, it can be disassembled for cleaning and inspection easily.

Dimensions of the dresser are: 2 in. travel head, permitting angle and form dressing up to 2 in.; and radii from 0 to 1 in. concave and convex.

Randolph Laboratories Fire Extinguisher Locater Signs

Randolph Laboratories, Inc., 8 East Kinzie St., Chicago 11, Ill., has developed a fire extinguisher locater sign. It is a decal water-transfer that can be placed easily above each extinguisher.

The sign is circular, 10 in. dia., printed in large white letters on a bright red background. It is said to be visible for 75 ft.



Landau collet chucks

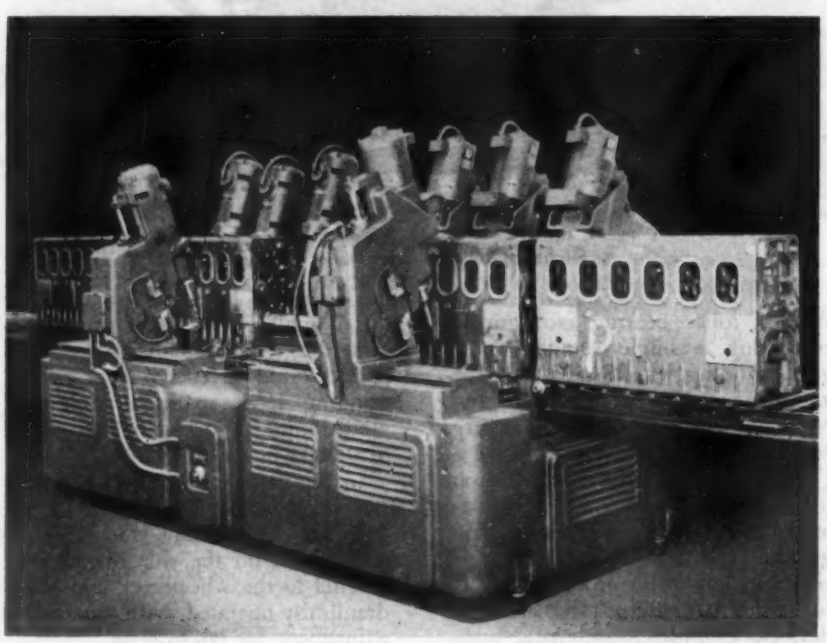
Landau Chucks Avoid Strain On Collets During Closure

Two types of draw-in collet chucks have been placed on the market by the Landau Machine Company, 545 Fifth Ave., New York 17, N. Y. Each chuck embodies features that avoid placing a strain on the collet during closure and maintenance of accuracy to within 0.0005 in.

Unit A has a No. 3 taper shank for accurate interchangeable mounting on any lathe, milling machine, or dividing head. All standard collets up to ½ in. capacity can be used with the device. The bore is 33/32 in. through. A hardened steel bushing absorbs the strain of clamping the work. Overhang of Unit A is only 1⅞ in., its diameter is 2¼ in. The gripping wheel is large enough for easy grasp by the operator.

Unit B operates on the same principle but fits any 1½-8 thread spindle nose. Maximum capacity is for ⅝ in. stock. As with Unit A, a hardened steel bushing at the front of the chuck receives the body of the collet, but the threaded end of the collet is screwed into an interchangeable threaded bushing at the rear of the unit. This construction likewise absorbs the strain of tightening the collet. Moreover the rear threaded bushing can be changed easily to suit any collet in the shop. Overhang from the rear of the hub to the center of gripping is only ⅞ in. Diameter of hub is 1¾ in. Total over-all length of chuck, 4 in.

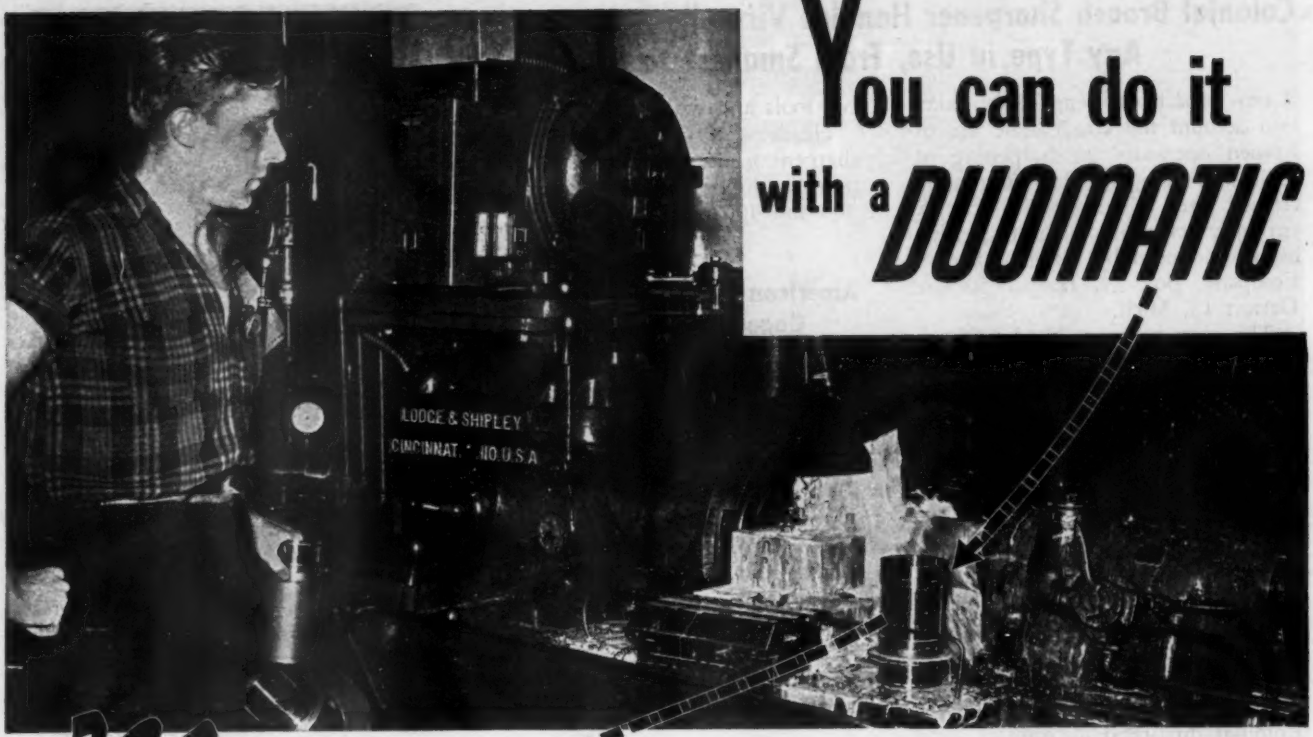
Cross Automatic Transfer-Type Processing Machine Developed for Machining Cylinder Blocks



Cross automatic cylinder block processer

The Cross Company, Detroit, Mich., announces a new completely automatic transfer-type processing machine for cylinder blocks. Work is picked up from the conveyor, power loaded into the machine, automatically transferred from station to station, automatically located and clamped during cutting operations, drilled and tapped automatically and simultaneously, automatically released after cutting operations are completed and automatically power ejected and delivered to the conveyor.

Production is given as 45 pieces per hour at 80 percent efficiency. The number of stations per machine is dictated by the nature of the work.



You can do it with a DUOMATIC

Machining cylinder barrels for RANGER AIRCRAFT ENGINES

Lodge and Shipley's Duomatic Lathes continually demonstrate remarkable versatility in meeting the special or standard problems of the aircraft industry. For example, in machining the revolutionary cylinder barrel used in Ranger aircraft engines.

This new aircraft engine cylinder barrel, developed in Fairchild's Ranger laboratories, permits an important increase in air-cooled engine horse-power. With Fairchild's unique "Al-Fin" process, the steel cylinder core is *chemically bonded* with an aluminum "Al-Fin" muff, permitting faster engine cooling. To machine these new cylinder barrels with the required speed and precision, Lodge & Shipley Duomatics were selected.

The Duomatic is a full automatic lathe, with dual tool slides which can be operated singly or together. (See photo at left.) This permits more advantageous use of multiple tools—front and rear—in turning, and in straight and angular facing operations. For better, more profitable performance, call on Lodge and Shipley Engineers, or write on your company's letterhead for Bulletin 601 FL.

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

ENGINE • AUTOMATIC • TOOL ROOM • OIL COUNTRY LATHES

L & S LATHES

Colonial Broach Sharpener Handles Virtually Any Type in Use, From Smallest to Seven Feet

A new broach sharpener which takes into account the larger scale use of women operators in sharpening of tools and also provides for the increased sizes of broaches which are currently being used in industry, has been announced by Colonial Broach Company, Box 37, Harper Station, Detroit 13, Mich.

The new sharpener, model CS2, is designed to handle virtually any broach in use today. Sizes which can be sharpened range from the smallest up to 7 ft. long and a maximum diameter of 6 in. or of 8 in. width for flat broaches.

Broach sharpening is said to be eased by the lightweight alloy construction of the sliding head, supported and guided on by full anti-friction double-row rollers. All anti-friction bearings are completely sealed against entry of grinding dust.

Available at slight extra cost are the Colonial dual-ratio micrometer hand wheels which make possible the maintaining of identical steps per tooth in regrinding broaches and with which feed can be controlled to the ten-thousandths of an inch.

Another feature available at slight added cost is a special roller curtain designed to protect the machine ways when the table is moved to one side or the other. This design permits a reduction of 6 ft. in floor space length required when sharpening broaches of the maximum length of which the machine is capable.

Change-over from sharpening round to flat broaches is accomplished quickly and conveniently without special tools and with few adjustments.

Headstocks for cylindrical broach sharpening are provided with reduction gearing giving spindle speeds of 200 and 400 r.p.m.

American Diamond's Grinding Gage Measures Continuously

An improved Pratt grinding gage, which continuously measures the diameter of external cylindrical jobs while work is in progress and automatically indicates the point at which the correct diameter is reached, is announced by American Diamond Tool & Gauges Company, 7523 Fenkel Ave., Detroit 21, Mich.

The improved gage is said to provide also a continuous visible check on out of roundness and the amount of error. Perfect roundness and accuracy of diameter within 0.0001 in. are said to be easily maintained, even by semi-skilled operator. At no stage of operation need the machine be stopped for hand calipering.

The standard model measures diameters from 5/16 in. to 27 in. Special gages, as for side wheel grinding, are made to meet individual requirements.

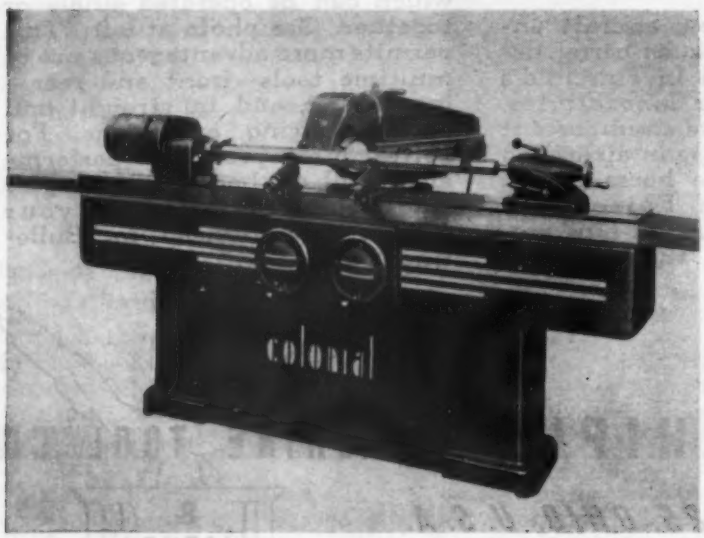
Pratt grinding gage

Allis-Chalmers Magnetic Type Air Circuit Breaker For Vertical-Lift Metal Clad Switchgear Equipment

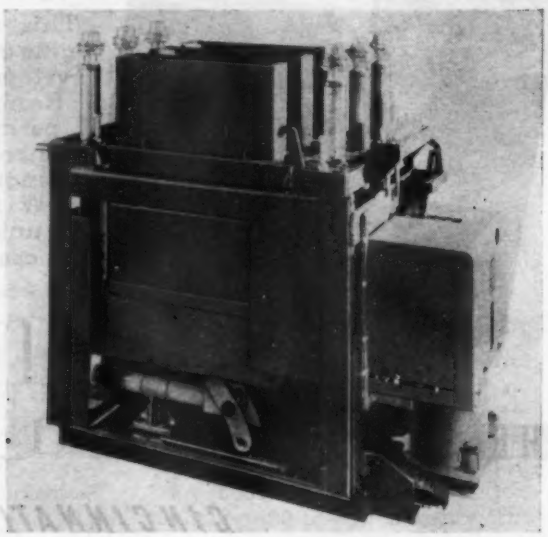
A new "Ruptair" magnetic type air circuit breaker has been developed by Allis-Chalmers Mfg. Co., Milwaukee, Wis., and is now available in high voltage, oil-less switchgear rated 5,000 v. and below and 150,000 kva. interrupting capacity and below.

In the new air breaker the arc chute has been carefully coordinated with the contact and arc runner design to give consistent and reliable interruption through the entire range of current to be interrupted. The magnetic circuit, consisting of one husky blowout coil and two laminated iron pole pieces per phase, is arranged to force the arc up into the arc chute immediately upon separation of the arcing contacts.

Complete inspection and maintenance of the self-contained contact assembly can be accomplished without disturbing the arc chute or magnetic circuit in any way.

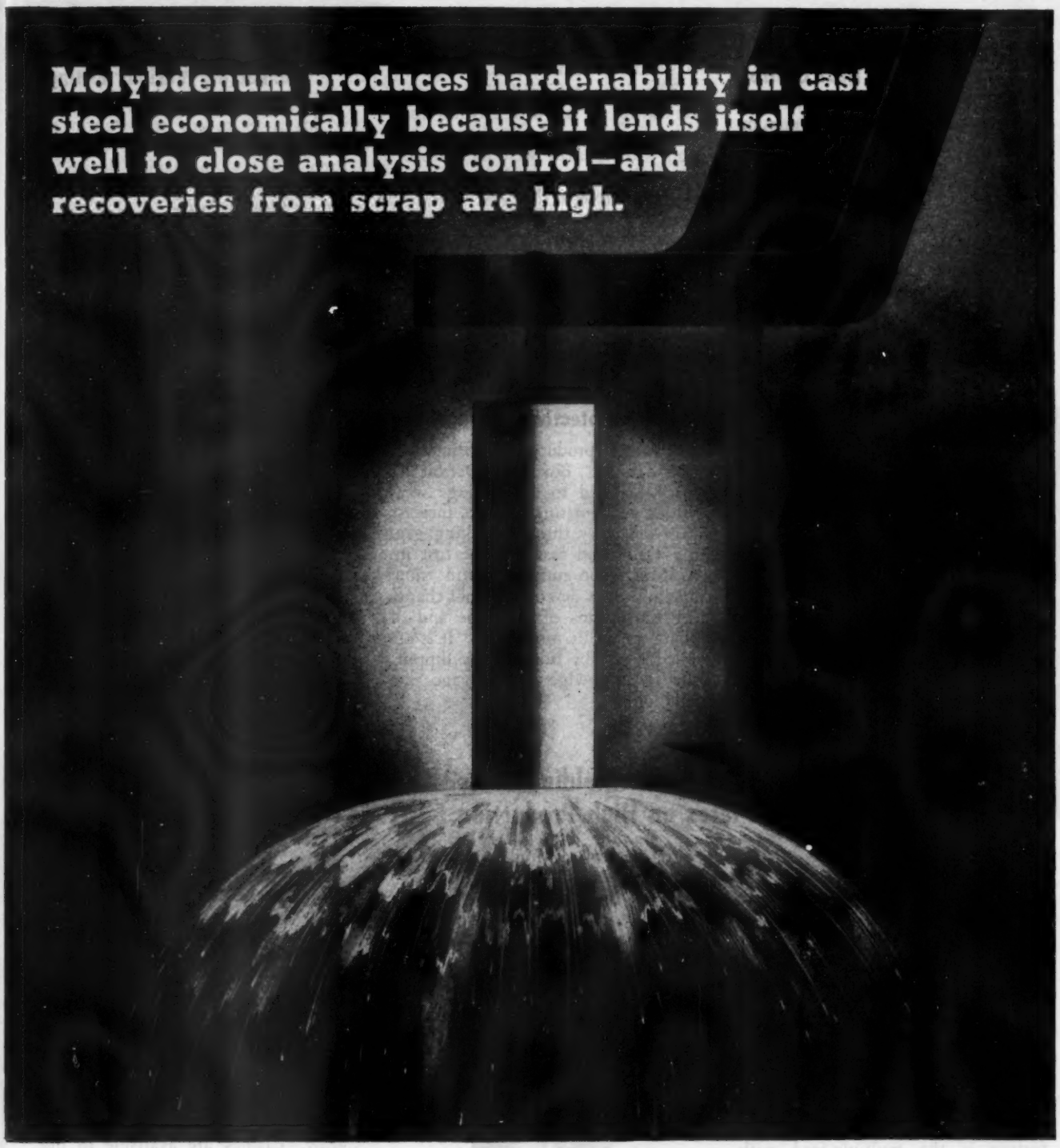


Colonial universal broach sharpener



Allis-Chalmers "Ruptair" circuit breaker

Molybdenum produces hardenability in cast steel economically because it lends itself well to close analysis control—and recoveries from scrap are high.



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue · New York City

MOLY

Westinghouse Spot Welding Timer and Heat Control

Suitable for welding small objects of high conductivity such as aluminum or copper, a new precise welding timer with heat control for timing intervals of one-half cycle or less is announced by Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

Precision is attained by making the welding current start at the same point on the voltage wave for every operation. The new SP-18, one-half cycle timer is designed for welding of such items as radio tube parts and sockets, pig-tail resistors to terminal lugs, watch and instruments parts, contact tips on electrical relays and other small parts.

The timer is furnished as a separate control for use with existing small bench welders and also in combination with a small welding transformer. Only one control tube is used, this thyratron serving the dual purpose of rectifying alternating current to charge a firing capacitor and also firing the small ignitron power tube. Heat control is accomplished by a phase shift method. The timer is rated at 230/460 v, 50/60 cycles.

Westinghouse Type S-18 spot timer

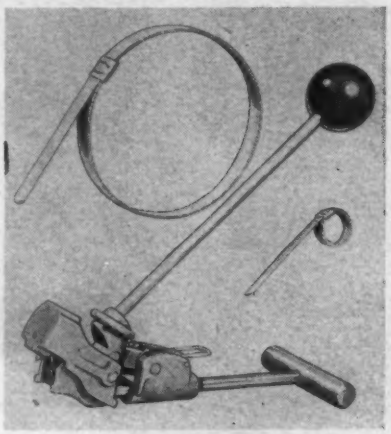
Gage-Lube, a Product of Protective Coatings, Inc.

Gage-lube, produced by Protective Coatings, Inc., Box 56-Y, Detroit 27, Mich., is said to reduce gage wear through eliminating friction, increase gage efficiency through making gaging easier and faster, to be rust inhibiting, non-gumming and non-loading. It is described as not changing dimensions of the gage and of being unusually economical. It is applied either by brush or by dipping the leading edge of the gage into solution.

Punch-Lok Hose Clamps for Connecting Various Fittings

Punch-Lok hose clamp, available from ¾ in. to 48 in. i.d. from Punch-Lok Company, 321 N. Justine St., Chicago 7, Ill., is a mechanical device for connecting various kinds of male and female fittings, special nipples, menders or ordinary pipe to hose. It is said to be capable of fitting all types of hose, or any kind of flexible coupling between rigid pipe lines or fittings for air, steam, bituminous materials, gasoline and oil.

Punch-Lok hose clamps and fittings have been engineered to make application possible without injury to the hose itself, the manufacturer states, and once the clamp has been locked, neither vibration nor rough handling can loosen it.



Punch-Lok hose clamp

The No. 3 clamp with a ⅜ in. band width is designed for applications ranging from ¾ in. o.d. down to 3/16 in. i.d. hose. Clamps ranging in diameter from 1 in. to 48 in. i.d. have a band width of ⅝ in.

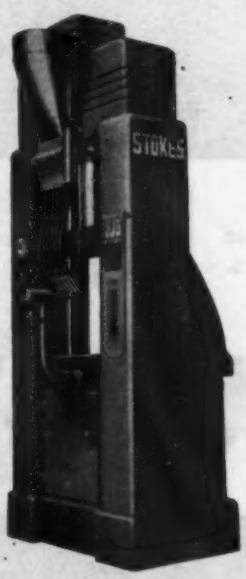
Where corrosion resistance is essential, Punch-Lok clamps may be obtained in "Everdur," a copper base alloy. Clamps are available in preformed or open end type.

Stokes Announces 50-Ton Automatic Molding Press For Large Plastic Pieces on High Production Basis

A fully automatic, 50-ton plastic molding press, No. 235, has been announced by F. J. Stokes Machine Company, 5930 Tabor Road, Olney P.O., Philadelphia, Pa. It operates on the hydraulic principle and is designed to mold larger pieces at minimum cost.

One of the most important features is said to be the patented "trap" or checking device which is sensitive to a fraction of a gram, yet rugged enough for heavy duty on a 168-hr. weekly production basis. Another feature is the multiple-feed with micrometer adjustments for capacities up to 48 cu. in. This flexible device distributes the molding power how and where required in the mold. Operating in connection with the feed device are new simplified ejection and knock-out systems, all governed by a patented timing control unit.

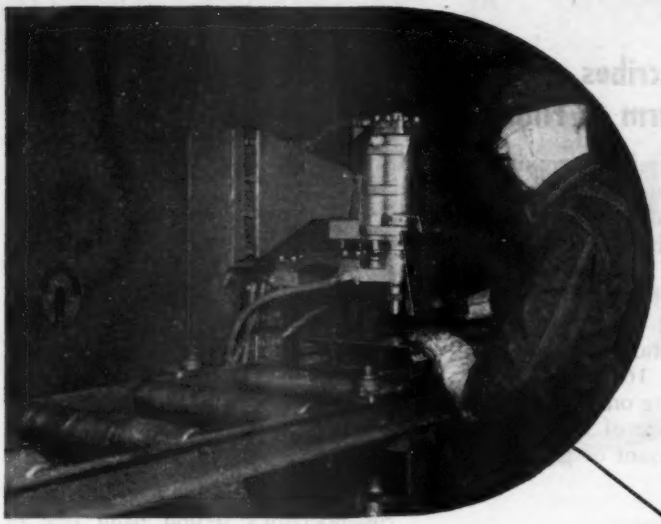
The new hydraulic-automatic press is self-contained and electrically powered and heated. Its low cost of operation is evidenced in the fact that only a 2 hp. motor is needed to develop the machine's full 50-ton pressure capacity. The press opens and closes at the rate of 100 in. per min. with controlled final compression speed adjustable to the flow characteristics of the molding material. Push-button control permits semi-automatic operation when necessary to adapt this press to insert work.



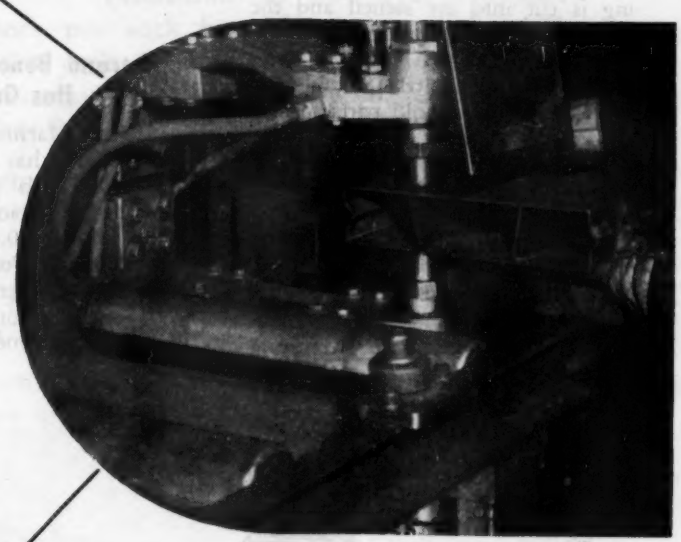
Stokes 50-ton plastic molding press

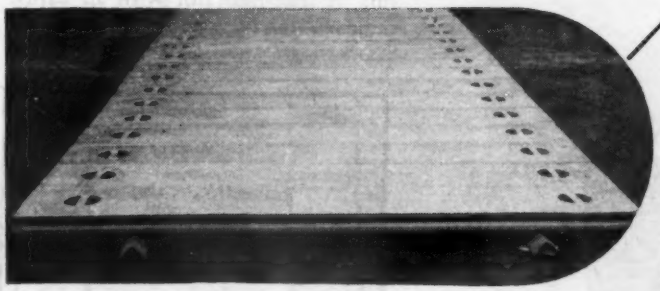
Haynes Stellite Used for Cutoff and Grooving Tools

Grooving and cutoff tools of Haynes Stellite cobalt-base alloy are made by Haynes Stellite Company, a unit of Union Carbide and Carbon Corporation, 30 East 42 St., New York. The grooving tools are finish ground and lapped to specified tolerances. The cutoff tools are ground to size but not lapped unless specified by the purchaser. Both types may be obtained in either 98M2 or Star J-Metal alloy.



Conveyorized Spot Welding with a PWC Pedestal Welder





Top: Steel hatch cover sections for ships having Z-bar reinforcements welded into them while passing down a conveyer. The Machine is a modified Standard PWC 100 KVA Welder.

Center: Top and bottom Z-bar flanges are welded simultaneously, the current going through the Z-bar. The welder is equipped with upper and lower guns. Machine compensates for current losses.

Bottom: It takes sixteen sections to make a unit and three units to make a hatch cover. The design and process saves many pounds and makes it simple for only 2 men to open and close a hatch.

Not so long ago, many people would have said that a job like this was "impossible": series welding a Z-bar of #11 gage steel into a box of #14 gage. Twelve spot welds are made on each Z-bar. Production averaged approximately 75 to 80 sections per hour (30 secs. per section at peak production). Material was fairly scaly hot-rolled steel.

To do this job, a PWC Pedestal welder equipped with lower as well as upper gun was built right into the conveyer line. The machine like other PWC equipment is designed for ready conversion for post-war production requirements.

For the complete story on this operation ask for Welding Pictorial #37.

For further information on the PWC line of standard Pedestal welders ask for Bulletin #502.

PROGRESSIVE WELDER CO.

SEAM PROJECTION & BUTT • *Electric Welding Equipment* • PORTABLE GUN & PEDESTAL

3050 E. OUTER DRIVE • DETROIT 12, U. S. A.

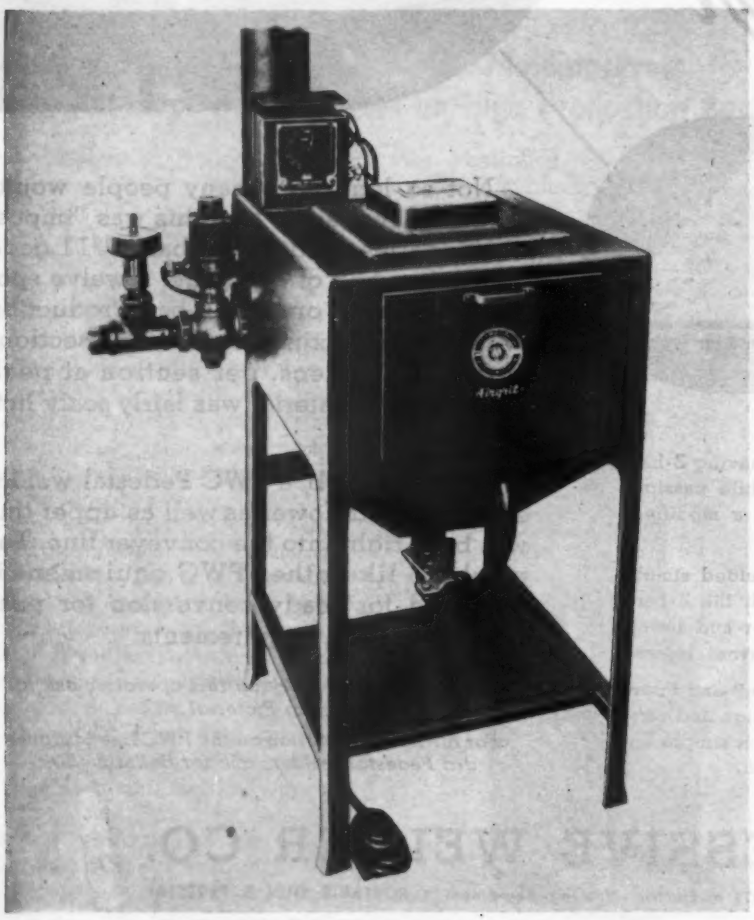
Matthews Airgrit Marking Unit Quickly Inscribes Delicate Precision Parts Without Harm to Finishes

The "Airgrit" marking unit, designed and being manufactured by Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh 13, Pa., is intended for marking delicate and precision parts having a ground or mirror surface that cannot be marred or distorted. Marking of metal, glass, fibre or plastic parts is accomplished by means of a short blast of fine grit material against rubber or celluloid stencil masks upon which the part to be marked is placed. The desired marking is cut into the stencil and the resulting mark is a light, clear-cut impression, without liquid to cause rust and without burrs. Suitable fixtures are made to hold parts so that they can be quickly handled by the operator. Parts can be marked as fast as they can be handled by the operator.

The unit is operated by air pressure and is similar to sand-blasting, except that it is constructed for very fine work. It operates most successfully on five to eight lb. pressure at the nozzle and requires approximately 30 cu. ft. per min.

An electric solenoid valve and a timing unit enable the operator to fix the length of blast, so that parts may be marked uniformly and with greatest legibility.

Other specifications are: height, 30 in.; floor space, 16 in. × 19 in.; area of blast, using one ⅝ in. nozzle, ¾ in. square; size of air feed line, 1½ in. dia.; amount of grit used in unit, 15 lb.



Matthews Airgrit marking unit

Sundstrand Bench Center Has One Hand Control

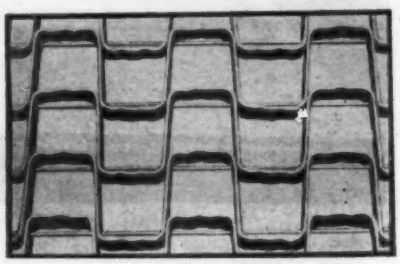
Sundstrand Machine Tool Company, Rockford, Ill., has brought out a new improved bench center by use of which accuracy can be maintained to within limits of 0.0001 in. in checking for runout. Precision checking of work between centers is simplified and speeded by one-hand control of all movable elements, which leaves the operator's second hand free to control the part being checked.

Sundstrand bench center

The center in the l.h. head is fixed but the center in the r.h. head is spring loaded and can be retracted by the end bar for quick loading and unloading. Front clamp on r.h. head locks the center in position during checking operation.

Center holes of both r.h. and l.h. heads are bored together for accurate alignment.

The Sundstrand bench center is described as compact, easily cleaned and portable. It includes the bed and two heads as standard equipment and is available in sizes 6 × 18 in., 6 × 36 in., 12 × 36 in., 12 × 48 in., 12 × 60 in. and 12 × 72 in. A dial indicator with an adjustable holder is available.



Klemp steel safety mat

Crimp Gives Klemp Steel Safety Mat Added Protection

New improved steel safety mats manufactured by Wm. F. Klemp Company, 6641 S. Melvina Ave., Chicago 38, include a slight crimp or center bend in one side of the strong steel mesh for added non-skid protection. These mats are said to prevent slipping and falls, keep feet dry, make lifting safe, reduce fatigue and prevent accidents. They are non-absorbent and easily cleaned in hot water or cleaning solution. They may be had in any size to 25 × 6 ft.

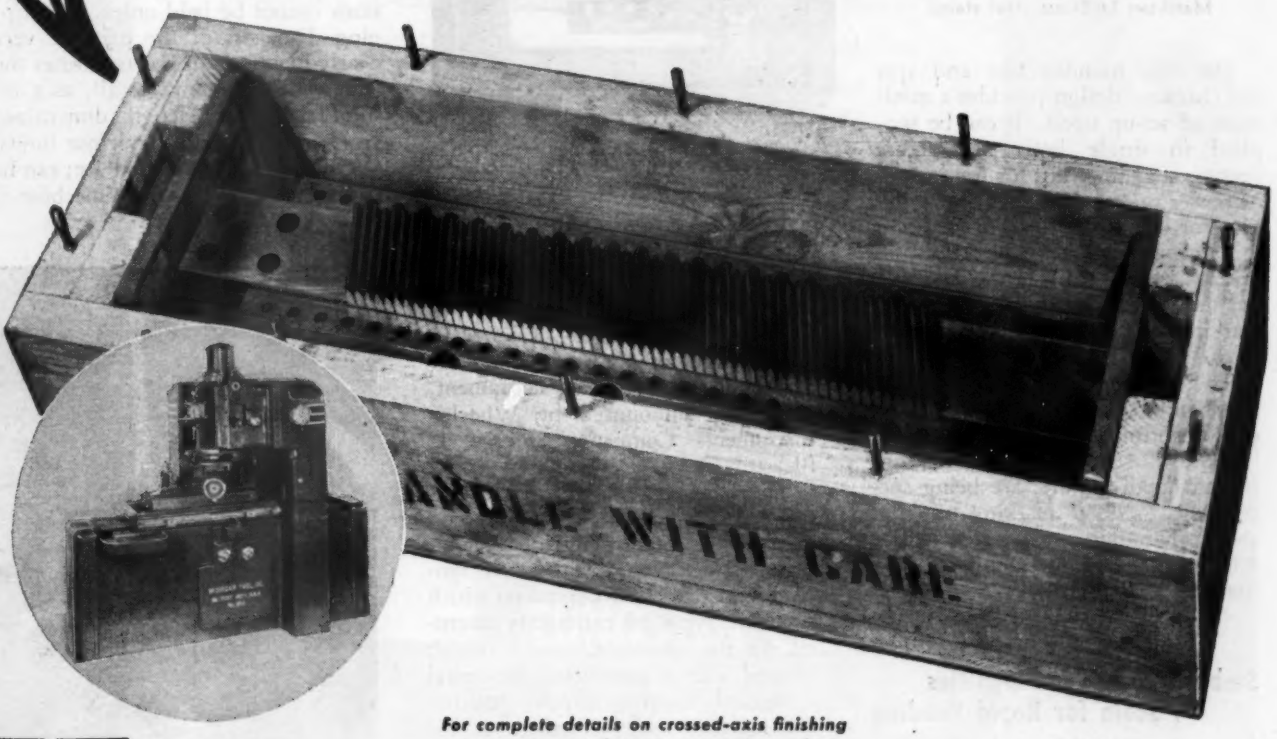
A million quiet gears IN ONE BOX

Production of well over 1,000,000 gears per rack have been reported on the Michigan 900 rack type crossed-axis gear finishing machine that turns out quieter helical and spur gears than can be produced by any other finishing process.

Hand in hand with its high output rate and consistant gear quality goes the lowest tool cost per gear of any gear finishing process.

Where production and accuracy warrants, the rack type gear finisher remains the ideal method of finishing gears up to 8 in. diameter. One rack will finish all gears of the same pitch and P. A. in a wide range of helix angles.

For high helix angles or for spur gears, rack blades are usually set at a compensating angle for maximum crossed-axis shaving efficiency.



For complete details on crossed-axis finishing ask for Manual #GF-43 and Bulletin #900.

ORIGINATORS of GEAR SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD . . DETROIT 12, U. S. A.

BUY U.S. BONDS STAMPS

Matthews Lo-Stress Steel Marking Stamps are Ready

A new style of rounded face characters has been developed by Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh 13, Pa. These are meant for engraving on steel stamps, steel dies and for marking of parts placed under torsion, tension, bending or any combination of these. They are also intended for use where heat treating is accompanied by cracking or breaking due to stress concentration, incident to conventional marking with sharp face stamping tools.

Matthews Lo-Stress steel stamp

The new rounded face and special character design provides a minimum of set-up stress. It can be supplied in single letter and figure stamps, stamping dies for use in foot or power operated presses, and roller dies for use in all types of marking machines and in steel type for use in steel type holders. It is also available in multiple character stamps for marking flat, concave or convex surfaces.

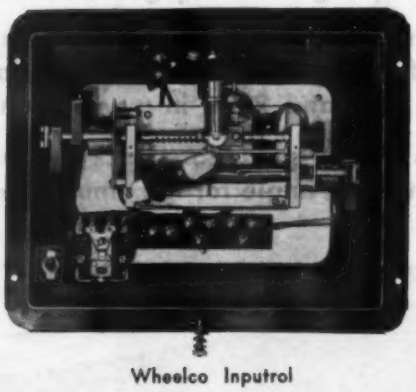
The new character design can be supplied in stamps, dies or type holders to control the depth of the mark. "Lo-Stress" stamping tools with controlled depth feature, are being successfully used in marking of thin sheet aluminum, steel, etc., where 0.003 to 0.006 in. depth of stamping must be maintained.

Stebar Magna-Eye Magnifies Scale for Rapid Reading

Stebar Co., 711 West Lake St., Minneapolis 8, Minn., has developed the Magna-Eye to aid in reading micrometers. This lightweight magnifier fits closely over the scale on a micrometer, magnifying the divisions and numbers, and enabling the worker to read the scale rapidly and correctly and without eyestrain. The Magna-Eye gathers light and makes the micrometer readable in poorly lighted places, where otherwise it would be impossible to read. This attachment protects the micrometer from dust and dirt, reducing cleanings and prolonging its accuracy.

Stebar Magna-Eye

The Magna-Eye is available for use with all standard makes of micrometers.



Wheelco Inputrol

Wheelco Inputrols Designed To Control Input of Power

Two models of Inputrols—automatic and manually set—designed to control input of power, heat or flow of liquids to any process equipment, have been announced by Wheelco Instruments Company, Chicago 7, Ill.

The basic elements of the Inputrols are a mercury switch mounted on a carriage, a rotating horizontal cylindrical cam driven by a small synchronous motor and a spiral on which the mercury switch carriage is mounted. In the automatic model, which is used with a pyrometer, the spiral is turned automatically to position the mercury switch carriage at the proper point along the rotating cam. In the manual model, the spiral is set by hand to input point desired.

The Inputrol scale is illuminated and in terms of percent of maximum input. Inputrols may be flush or surface mounted.

Du Pont High-Speed Copper Plating Process Cuts Cost

An improved high-speed copper plating process which reduces operating costs and speeds production is announced by E. I. du Pont de Nemours Company, Wilmington, Del. The new gains were achieved by working out a method of substituting potassium cyanide and other potassium salts for the sodium salts formerly used with still further increases in current densities.

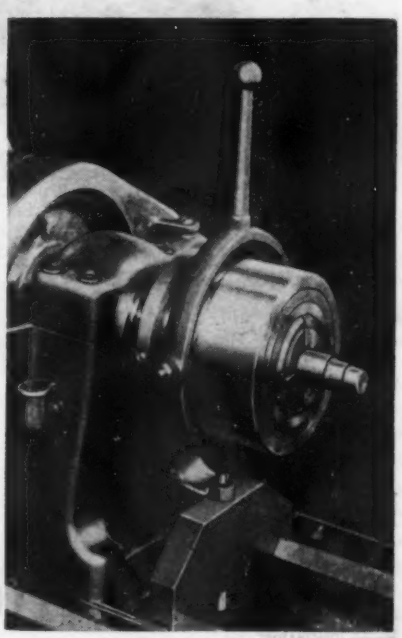
The new process effects savings; even though potassium cyanide is costlier than sodium cyanide, a smaller amount is required.

Zagar Collet Speed Chuck With Non-Moving Collets

Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio, is manufacturing a collet speed chuck described as ideally suited to turning bar stock, facing off and second operation turning. It can be used on screw machines, on lathes and wherever collets are standard equipment.

Many collet attachments move the collet horizontally to close the jaws around the stock, and thereby in second operation turning, length dimensions cannot be held unless the gripping diameters of the part are very nearly identical. In Zagar fixtures the collet does not move at all; as a result, face-off and length dimensions can be held within very close limits.

Other advantages listed are: can be opened and closed while machine is



Zagar collet speed chuck

WHAT DO You PAY FOR IN CARBIDE TOOLS?
Carbide tipped cutting tools have done such a phenomenal job in increasing production, cutting costs and improving quality that it is easy to overlook some fundamentals when we talk about carbides.
For example, tool cost per piece with carbides depends even more on the know-how of tool design, grade selection, precision, manufacture, and application than it did with high speed steel tools.
To meet mass tooling requirements for war, everybody in the carbide industry—including ourselves—has been producing so-called "standard" tools. Even in peacetime, of course, there will be a place for such tools, but we also know that when COST PER PIECE is an important consideration, the lowest priced tool is not necessarily the best.
We at T.C.T. have been producing carbide cutting tools since they were first introduced in the United States. We know from experience that T.C. tipped tools, tailored for a specific job more than pay for their initial cost. It is well at this time not to lose sight of this fact, when most of us have become accustomed to ordering standards to obtain something in a hurry.
TUNGSTEN CARBIDE TOOL Company
2661 Joy Road, Detroit 6, Michigan
TCT

running; does not heat; being independent of spindle, can be mounted on face plate and be indicated to run dead true regardless of any spindle run-out; affords greater than usual collet capacity.

It is precision-made, being hardened and ground through. It is available in 1 in. and 2 in. sizes. The 1 in. size takes a standard 5-C Hardinge type collet; the 2 in., a master collet using standard W. & S. type collet pads. Maximum capacity with special collet is 2⅝ in. dia. × 1½ in. deep.

Diamond Tools Announces Line of Super-Cut Tools

A full line of Super-Cut tools is announced by the Diamond Tool Division of Industrial Abrasives, Inc., 3724 West 38th St., Chicago 32, Ill.

Twenty-two of the new Super-Cut tools are available in a variety of types to fit all standard grinding machines and individual uses—wheel dressers, gear grinders, thread grinders, radius and form dressing, boring tools, gage points, chisel edges and multiple set and cluster type dressers.

Barco Combination Surface Plates and Angle Iron

Barco Scraping Co., 1975 East 65 St., Cleveland 3, Ohio, is producing a specially designed 35 × 60 in. surface plate to which is bolted and pinned at right angles a 24 × 32 in. plate, giving a combination surface plate and angle iron. Both plates are hand-scraped to within 0.0002 in. The smaller, vertical, plate is scraped on top, face and both sides, which are square with each other as well as with the larger plate.

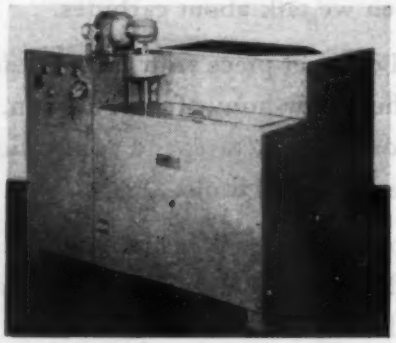
Weights: 35 × 60 in. plate, 1.650 lb.; 24 × 32 in. plate, 380 lb.; stand, 325 lb.

Barco combination surface plates

Youngstown Builds Ethyl Cellulose Melt, Dip Tank

The Youngstown Miller Company, Sandusky, Ohio, has designed and built an ethyl cellulose melting and dipping tank that incorporates all the requirements set up by the manufacturers and ordnance for control of this material.

Indirect heat is employed. Thermostatic control is maintained over both the heat exchange medium and the plastic to insure that neither rises over their maximum allowable temperature. The plastic is melted and preheated to proper temperature for dipping before entering the dip tank. Extremely close control and uniformity of temperature is achieved with



Youngstown melting and dipping tank

low heating surface temperature.

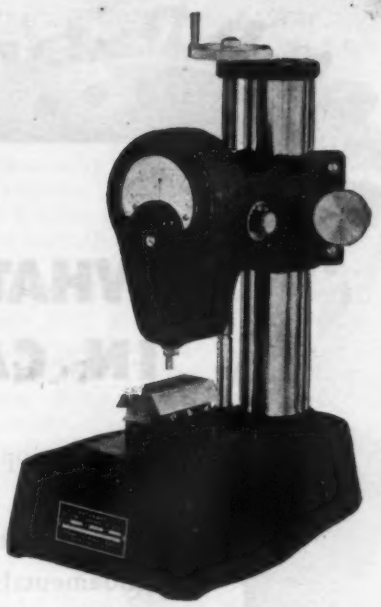
The plastic is circulated in such a way as to have constant level in the dipping tank and continual removal of the surface film that tends to form, and air bubbles which arise from the dipping of certain shapes.

Hathaway Electronic Comparator For Multi-Range Inspection

Hathaway Instrument Co., Denver 10, Colo., is manufacturing an electronic comparator for close tolerance measurement of finished parts on the production line. Gaging may run from millionths of an inch to ten-thousandths, or to thousandths.

Magnification can be varied as desired by electrical controls. Variation in sensitivity is accomplished by turning a dial through three stages of adjustment. Spindle pressure is adjustable from 0 to 20 oz.

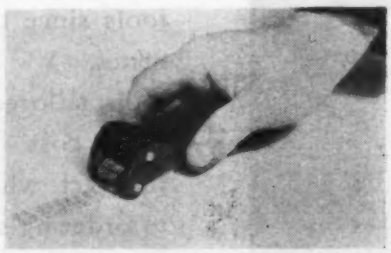
This comparator consists of a rigid stand carrying an anvil, gage head and the indicating instrument. The work to be measured is placed on the anvil and moved under the spindle. Deviations from normal are recorded on the dial. Electrical zero and magnification adjustments are made by means of controls. The circuit includes compensation for normal voltage and frequency variations so that the instrument may be operated from any 115 v., 60 cycle light socket.



Hathaway comparator

Topflight Marker for Flat or Round Metal, Wood or Fabric

A self-inking, portable, hand-operated parts marker, which is said to mark either flats or rounds quickly, clearly and accurately, has been developed by Topflight Tool Company P.O. Box 6728, Towson 4, Md.

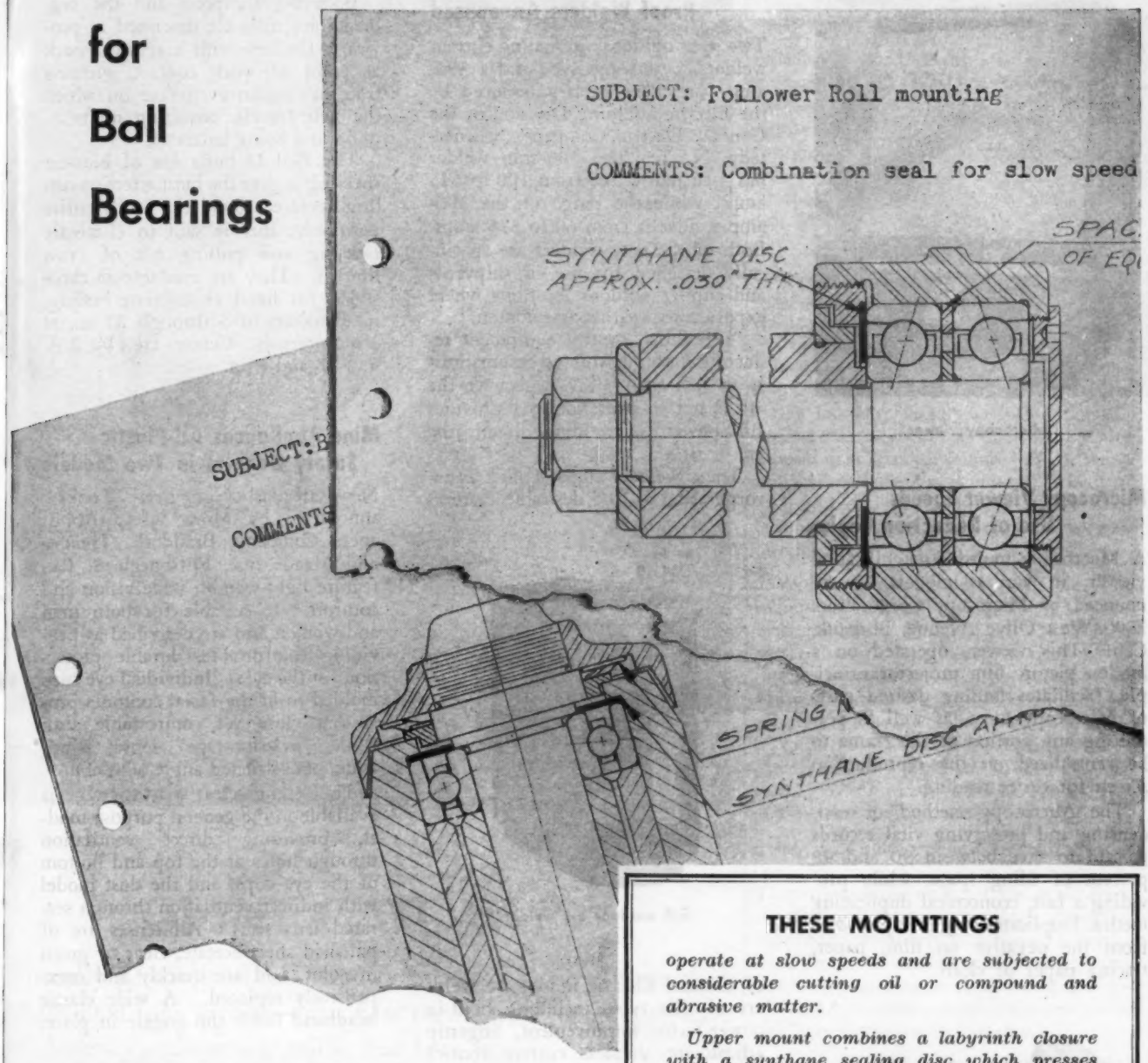


Topflight parts marker

Printing occurs by stroking the mounted type rings over a flat surface or rolling a tube in contact with the printing arbor. Single inkings from a stamp pad are sufficient for over 100 markings. Part number combinations are obtained by arranging type rings on a common printing arbor. The marker is available with rubber type rings in three sizes and is effective on metal, wood and fabric.

LOW COST LIFE ASSURANCE . . .

for Ball Bearings



● Ball bearings will give long life and fine accuracy — but only when they are enclosed by methods which assure adequate protection from dirt or other injurious matter.

At slow speeds a positive seal is frequently essential. Here are two that are not expensive and are adaptable to many applications.

If you use or intend to use ball bearings, New Departure engineers are always ready to help you get the most out of them.

THESE MOUNTINGS

operate at slow speeds and are subjected to considerable cutting oil or compound and abrasive matter.

Upper mount combines a labyrinth closure with a synthane sealing disc which presses lightly against the smoothly ground bearing face. Result is excellent protection against either wet or dry contaminants, without objectionable friction at speeds involved.

Lower mount swings through a wide arc and is thoroughly flooded with cutting oil. Speed of rotation is very slow. Under these conditions an extra sliding seal is used, consisting of a bronze ring held in light contact by a stock finger spring.

Seals such as these are relatively simple, occupy little space and are long-lasting. They also afford very good bearing protection and are efficient retainers for either oil or grease.

NEW DEPARTURE

BALL BEARINGS 3277

NEW DEPARTURE • DIVISION OF GENERAL MOTORS CORPORATION • BRISTOL, CONNECTICUT

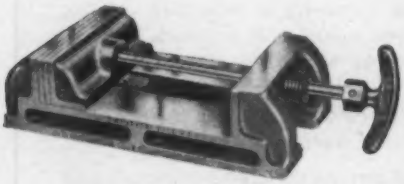
Sales Branches: DETROIT, G. M. Bldg., *Trinity 2-4700* • CHICAGO, 230 N. Michigan Ave., *State 5454* • LOS ANGELES, 5035 Gifford Ave., *Kimball 7161*

Microcopy viewer

Microcopy Viewer Speeds Use of Reduction Copies

A Mocrocopy multiple-magnification viewer, in various models, is announced by Microcopy Corporation. 2800 West Olive Avenue, Burbank, Calif. This viewer, operated on a motion picture film projector principle, facilitates finding desired parts of Microcopy films, as well as permitting any portion of the frame to be centralized on the reproduction screen for easier reading.

The Microcopy method of condensing and preserving vital records is said to save between 90 and 98 percent of filing space, while providing a fast, economical duplicating methd. Duplicates may be reproduced from the negative on film, paper, tracing paper or cloth.



Richards Twistite vise

Twistite Vise Features Heavy Construction, Extra Capacity

The V-6 Twistite vise introduced by J. A. Richards Company, Kalamazoo 13F, Mich., is described as featuring a new design, heavy duty construction and extra capacity, with the Richards Twistite unit for quick clamping action.

Specifications are: jaw, 6 in. wide, 1⅞ in. deep; opening, 6 in.; over-all length, 15½ in.; height, 3¼ in.

General Electric Weather Proof Welders Announced

Two new outdoor alternating-current welders, a 500-amp type and a 300-amp type, have been announced by the Electric Welding Division of the General Electric Company, Schenectady, N. Y. The 500-amp welder has a current range from 100 to 625 amps, while the range of the 300-amp welder is from 60 to 375 amps. Both of the new welders are specifically designed for use in shipyards and similar outdoor locations where exposure to weather is common.

"Idlematic" control equipment reduces the output voltage automatically to less than 30 v. whenever the arc is not in operation, yet provides full power for welding directly the arc is struck.

These welders are described as incorporating all the desirable features

G-E outdoor a-c welders

of General Electric indoor a-c welders of this type, including built-in power-factor improvement, fingertip adjustment, stepless current control and fan-forced ventilation.

Divine Contact Rolls and Polishing Buffs Available

Divine Brothers Company, 102 Whitesboro St., Utica 1, N. Y., is offering lines of compress contact rolls, segment face contact rolls and Red D buffs. The compress contact rolls, of three densities of leather for hard cutting or roughing and five densities of canvas for moderate cutting and finer finishes, are available in 6 to 16 in. dia., by 2 in. steps, with faces of 2½ in. for the 6 in. dia., 3, 4 and 6 in. for each diameter to 14 in. and 3 and 4 in. for the 16 in.

Segment face rolls are available in 6 to 16 in. dia., with faces of 2½ in. for the 6 in., 2, 2½ and 3 in. for the 8 in., and 3, 4 and 6 in. for others.

Both the compress and the segment face rolls are described as providing the belt with a resilient back at point of work contact, running true, having an even face on which the belt travels, requiring no trimming and being balanced.

The Red D buffs are of bias-cut sheeting to give the most effective cutting surface around the buff's entire periphery; this is said to eliminate raveling and pulling out of cross threads. They are available in three styles, for hand or machine buffing, in diameters of 5 through 20 in., at 1 in. intervals. Centers are 1½, 2, 3, 4, 5, 7 and 8 in.

Mine Appliances All-Plastic Safety Goggles in Two Models

New all-plastic goggles, "Looks" announced by Mine Safety Appliances Company, Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa., feature light-weight, wide vision and comfort, are suitable for both men and women and are described as providing comfortable, durable protection for the eyes. Individual eye cups molded to fit the facial contours provide a close yet comfortable seal, while "aviation-type" lenses afford wide, unobstructed angle of vision.

The strong, clear plastic frame is available in the general purpose model, providing direct ventilation through holes at the top and bottom of the eye cups, and the dust model with indirect ventilation through serrated lens seats. All lenses are of polished sheet acetate, clear or green in color, and are quickly and inexpensively replaced. A wide elastic headband holds the goggle in place.

Mine Appliances plastic goggles

STEEL'S GIANT GATEWAYS

Virtually all the steel this country produces — now more than 90,000,000 tons a year—must pass through the giant gateways of America's blooming mills. For here begins the shaping of steel into useful form, as mighty steel ingots, brought to uniform white heat in the soaking pits, are skilfully rolled into long blooms and wide slabs.

The operation and maintenance of blooming mills at the highest peak of efficiency and production ever known contribute vitally to the output of war steel in this critical period.

Skill and speed in teamwork, with quality control in command, keep our fighting men armed with superior weapons and assure better steels in abundance when the world returns to peaceful work.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH, PENNSYLVANIA

J&L STEEL

CONTROLLED QUALITY STEEL FOR WAR

BLOOMS

Bloma was Anglo-Saxon for a small mass of malleable iron from which the dross or slag was beaten out with hammers in the hands of dawn-of-civilization workmen. This primitive method of making "blooms" was pushed aside by progress centuries ago. But the word for the product survives to give a name to the heavy blooms rolled from steel ingots on today's giant modern blooming mills.

Locomotive drove first reversing mill that became a blooming mill. In early mills the rolls moved in one direction only. An Englishman, John Ramsbottom, in the 1860's, manager of an iron works and a railroad, too, conceived the idea of a mill that could be reversed for repeated rollings back and forth. He coupled a railroad locomotive to one of his rolling mills and introduced the reversing mill to the iron and steel industry. This type mill evolved into today's great, powerful blooming mills, gateways for the vast tonnages of steel that made invasion possible.

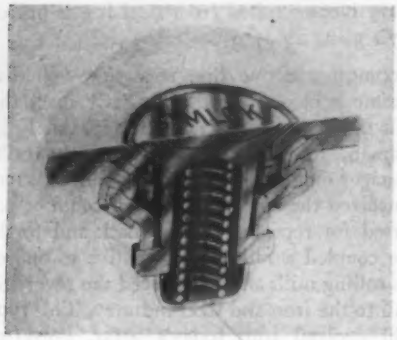
2 World records made on J&L mill. The rolling of 171,440 tons of ingots on the blooming mill of the Aliquippa (Pa.) Works of the Jones & Laughlin Steel Corporation during the month of March 1943 established a world's record in production of steel for war. During the establishment of this monthly world record, one of the three crews of the mill set up a world record for an 8-hour turn by rolling 512 ingots. This is at the rate of more than an ingot a minute.

Roller, manipulator, engineer constitute the operating crew of a modern blooming mill. They control the mill and the ingot from the "pulpit," a small room high above the floor of the three-story mill. Several hundred other workmen round out the rolling team that works together in close timing and coordination to obtain record production while rigidly maintaining high quality.

Army-Navy "E" was awarded Otis Works, Cleveland, of Jones & Laughlin Steel Corporation on July 24, 1944 with patriotic ceremonies. In his letter to the 5,000 employes, Robert P. Patterson, Under Secretary of War, said: "Your record will be difficult to surpass; yet the Army and Navy have every confidence that it was made only to be broken." Replying for the employes, H. E. Lewis, President of J&L said in part: "This recognition by our Army and Navy of a job well done will serve to inspire all of us to strive for even greater production in the critical days now upon us and yet to come." This is the third J&L plant to receive the award, the Aliquippa and Pittsburgh Works having been so honored previously.

First iron rails used by railroads in this country were imported from England in 1831, were 18 feet in length and light in weight. Standard steel rails today are 39 feet in length and weigh as much as 152 lbs. per yard.

Parts and Materials



Simlok fastener

Simlok Improved Design Cowling, Panel Fastener

The Simlok Division of the Simmons Machine Tool Corporation, Albany, N. Y., has announced design and construction improvements on its Simlok fasteners for cowlings and panels. The Simlok fastener fastens or unfastens with a quick quarter-turn.

When unfastened, the stud is self-ejecting, so that it can be noticed easily. One quick inspection determines whether or not all fastening operations have been completed. It is manufactured in three sizes, with flush, oval and wing head studs.

The tapered design of the fastener is said to make it particularly valuable in assembling curved sheets such as engine cowlings, actually forcing the assembly into proper alignment before it can be locked. These fasteners are described as completely eliminating side play and holding end play or spring deflection to a maximum of 0.008 in.

Dow Corning Developes High Temperature Insulation

Dow Corning Company, Midland, Mich., has announced plans to produce silicone products, including high temperature insulating resins which make possible the building of lighter, longer-lived electrical equipment. Composed of silicon and oxygen, these products are described as having exceptional heat resistance.

Exhaustive tests were made on a 250 kva, 440 v. generator with the new high temperature insulation. After approximately 3,000 hours at 482 F. operating temperature the insulation still was said to be in excellent condition.

Silicones can be produced either as solids or liquids in an infinite variety of forms.

Sola Small Chasis Mounting Constant Voltage Transformer

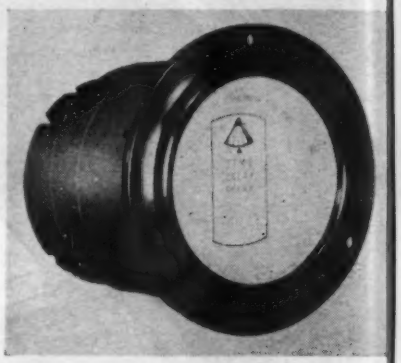
Sola Electric Company, 2525 Clybourn Ave., Chicago 14, Ill., is manufacturing a compact constant voltage transformer in a hermetically sealed case, designed for chassis mounting. Rated at 6.3 v., 17 va output, it will maintain that value within ± 1 percent regardless of line voltage variations as great as ± 12 to 15 percent. It is said to be especially valuable for

Sola constant voltage transformer

the stabilization of E-C oscillator circuits. Electronic equipment, in which this transformer is a built-in component of the basic design, does not require filament volt-meters or manual control.

Cramer Time Delay Relay Protects Electronic Tubes

The R. W. Cramer Company, Centerbrook, Conn., has developed its model TD6 time delay relay which, it is claimed, protects transmitter and electronic tubes. It has a cam operated switch mechanism and is mounted in dust and moistureproof bakelite case for panel mounting. It has a visible index showing open and closed position by means of graduated indicating dial.



Cramer TD6 time delay relay

Carbide and Carbon Chemicals Make Polyethylene Plastics

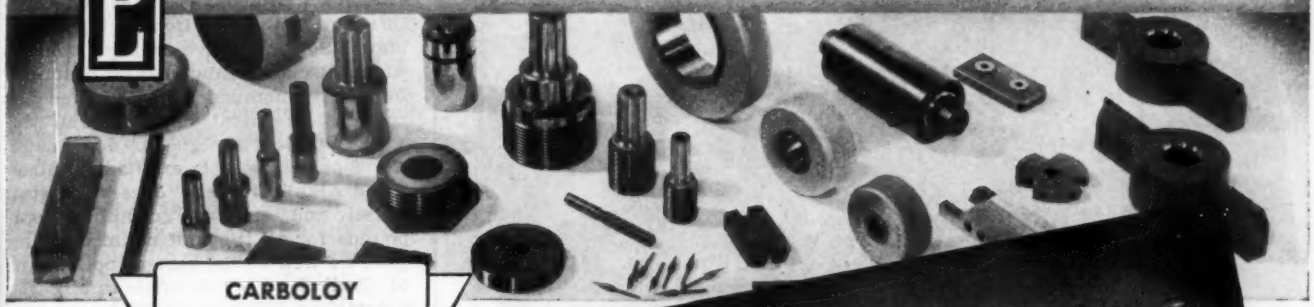
Polyethlene plastics, produced by Carbide and Carbon Chemicals Corporation, 30 East 42 St., New York 17, N. Y., are described as inherently flexible, translucent materials having excellent insulating properties. A component of coaxial cable used in radar equipment, they are said to be tough and resistant to shock, while the amount of water they will absorb is inappreciable and films of the material will not permit the passage of appreciable amounts of water vapor. Polyethylene softens at the unusually high temperature for thermoplastic materials of 230 F., and remains virtually unaffected by temperature —90 F.

By changing the conditions of manufacture, tensile strength, elongation of break, tear resistance and brittleness temperature can be varied. The resins can be made clear or colored for a variety of uses.

Some statistics: specific gravity, 0.92; softening temperature, deg. C. (transparency point), 105; water absorption, percent weight gain, 100 hr. at 25 deg. C., 0.05; tensile strength, lb. per sq. in., 1,800; brittleness temp., below —70 C. dielectric constant, 50 mc, 2.29.

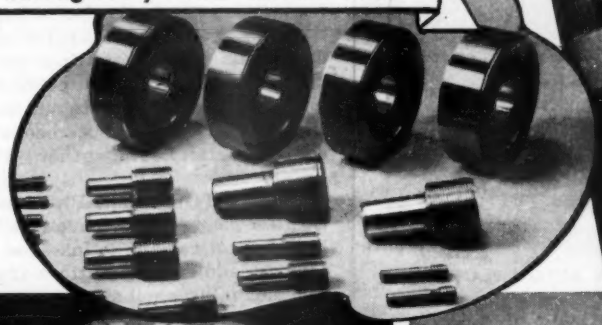
These Are Typical of

LINCOLN PARK GAGES AND NON-CUTTING PRECISION TOOLS

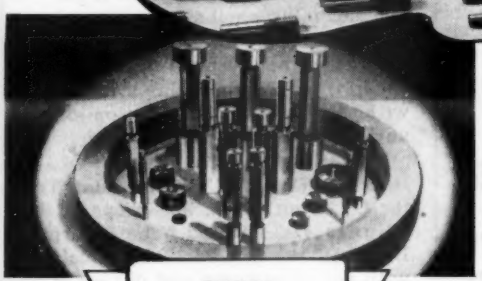


CARBOLOY

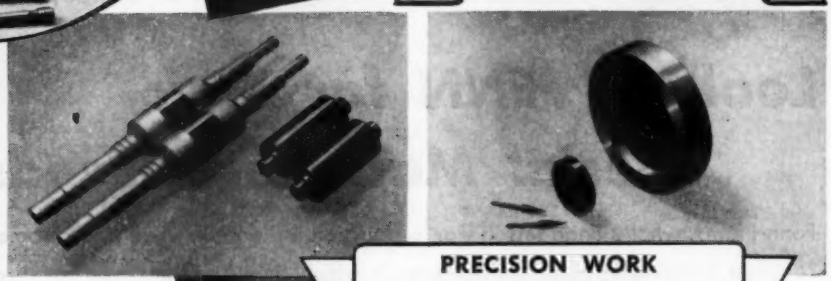
THREAD PLUG GAGES
Salvaged by Hard Chrome Plate



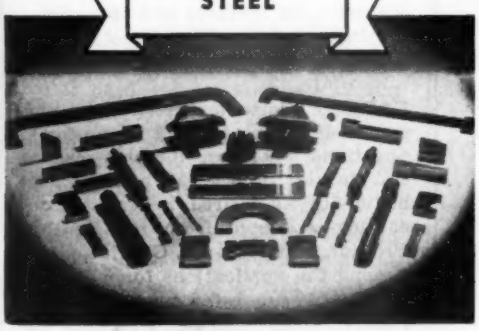
CHROME PLATE
NEW and SALVAGED



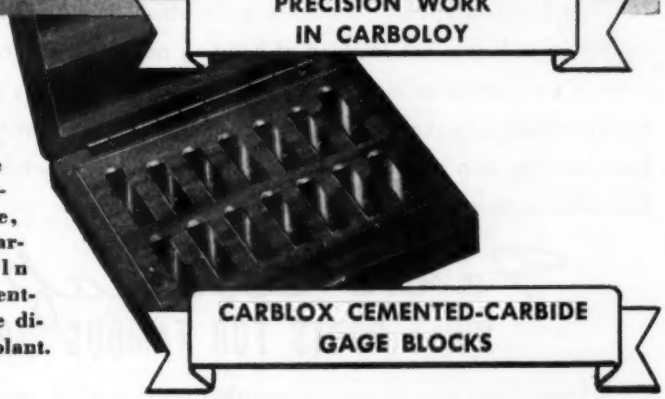
STEEL



PRECISION WORK
IN CARBOLOY



For full information on any of the products pictured here, see your nearest Lincoln Park representative or write directly to the plant.



CARBLOX CEMENTED-CARBIDE
GAGE BLOCKS

ARMY E NAVY

LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

1721 FERRIS AVENUE • LINCOLN PARK 25, MICHIGAN

THREE GENERATIONS OF MACHINE BUILDERS

HARTFORD PLANT

NEW BRITAIN PLANT

Look to FENN for Your Special Machinery Needs

Fenn Plants, wholly engaged in war production today, will, when peace comes, continue building special machinery, in which they have majored for three generations. If you are thinking of building new machines or remodeling old ones, it's time to plan Now. Fenn designers and engineers have solved many knotty problems in machine design, resulting in efficient, profitable production. Fenn has the men and experience to handle almost any machine design job. Consultation is invited and involves no obligation.

Fenn Aircraft

BUILT PARTS FOR FAMOUS PLANES

Fenn Plants are delivering precision parts and sub-assemblies for planes, artillery and other vital war equipment to practically every industrial center.

THE FENN MANUFACTURING CO.

HARTFORD, CONNECTICUT

TRADE PUBLICATIONS

CLEANERS The Detrex Corp., 13005 Hillview Ave., Detroit 27, Mich., has released two booklets on industrial cleaners. "Solvent Degreasing and Effective Methods of Conserving Chlorinated Solvents" is a 16-page booklet which discusses fundamental practices for the economical use of degreasing solvents in metal cleaning and describes typical designs of degreasers. An 8-page booklet entitled "Detrex Triad Alkali Cleaners" covers in detail alkali and emulsion cleaning compounds for all types of metal cleaning jobs, as well as the many applications of alkali cleaning materials in aircraft, automotive, railroad, metal fabricating and other industries.

CUTTING FLUIDS Complete information about Calol cutting fluids is presented in a booklet published by the Standard Oil Company of California. In addition the book also includes sections on machine tool operations, fundamentals of the cutting operation, metallic and abrasive cutting tools, machinability of metals, cutting fluid recommendation charts, recommended shop practices and other data.

CUTTING TOOLS The Pipe Machinery Co., 930 East 70 St., Cleveland 8, Ohio, has issued two bulletins—one on inserted-blade milling cutters (face, end and slot mills, shell or shank type) and the other on ground-thread milling cutters (straight or spiral flute, shank or shell type). The bulletins are complete with photos and information on the various types.

DIESEL ENGINES Caterpillar Tractor Co., Peoria, Ill., has prepared bulletin No. D43 entitled "The Caterpillar Diesel Way." The booklet is illustrated with action pictures and drawings and discusses the features and operation of the line of Caterpillar diesel tractors, motor graders and engines.

FABRIC "Cottonleather," a new abrasion-resistant plasticized fabric for applications where an abrasion-resistant and durable fluid-proof, heat-resistant, heavy-duty is desired, is described in a catalog available from the Southern Friction Materials Co., Charlotte, N. C. Among the applications for which this material is suggested are: covering for rollers, pulleys and treads, safety stair treads and floor coverings, chute lining, bearing wicking, textile frictions and numerous others.

FINISHING Those concerned with problems in heat resistance will find valuable information in a pamphlet entitled "New Approaches to Surface Protection" prepared by the Preferred Utilities Mfg. Corp., 1860 Broadway, New York 23, N. Y. It is primarily a technical discussion of the company's

preparations, White Hot and Pyro-Chrome, and their applications to items such as refractories, metals, ceramics and glass.

FURNACES W. S. Rockwell Co., 50 Church St., New York 7, N. Y., has issued two bulletins on industrial furnaces. Bulletin No. 409 covers standard pot furnaces and Bulletin No. 410 features forge furnaces. Both are illustrated and include complete data on construction features, uses and specification tables.

HEAT-TREATING A heat-treating guide has been prepared by the Carpenter Steel Co., 309 West Bern St., Reading, Pa., giving complete information on the heat treatment of all Carpenter matched tool steels. Data on each steel includes a type analysis, forging heat, normalizing heat, annealing treatment, hardening treatment, furnace atmosphere and recommended drawing range.

MANAGEMENT The War Manpower Commission, Bureau of Training, Apprentice-Training Service, Washington, D. C., has issued a 20-page bulletin entitled "Evaluating Apprentices." The book offers advice on how to determine the cost of training apprentices, as compared with the value of their production while in training, and explains how to record the skills acquired as the trainees advance from one step of their training to the next.

PILOT LIGHT 24 pages of illustrated models, diagrams, specifications, prices and other pertinent information has been published by the Gothard Mfg. Co., 1300 North 9 Street, Springfield, Ill., in booklet form entitled "Gothard Pilot Light Assemblies for Panel Board and Instrument Signaling." Lamps, brackets and accessories are also included.

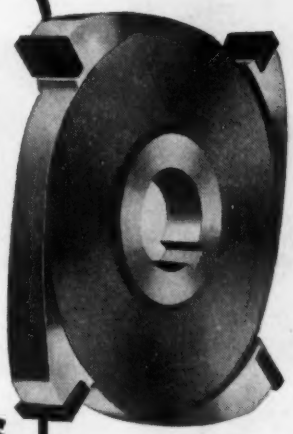
REAMERS A circular, illustrating and listing carbide-tipped chucking reamers, has been announced by Whitman & Barnes, 2108 West Fort St., Detroit 16, Mich. Complete prices and specifications are given on both taper and straight shank models.

RECTIFIERS "Fansteel Selenium Rectifiers," Bulletin RDP-105, available from the Fansteel Metallurgical Corp., North Chicago, Ill., is a 12-page booklet which contains technical information, specifications, illustrations, wiring diagrams, catalog listings and ordering references on more than 130 standard Selenium rectifiers. These include d-c power units for direct operation without battery of chucks, solenoids, relays and other d-c appliances; battery chargers for batteries ranging from 6 to 60 cells; and rectifiers for emergency lighting systems providing controlled high and low charging rates with either automatic or manual two-rate charging operation.

Again

WENDT SONIS

STANDARDIZES another group of carbide tipped tools



MILLING CUTTERS. Styles for milling cast iron and non-ferrous materials. Latest type carbide tipped tool. Diameters: 3" to 8". 4 to 10 teeth.

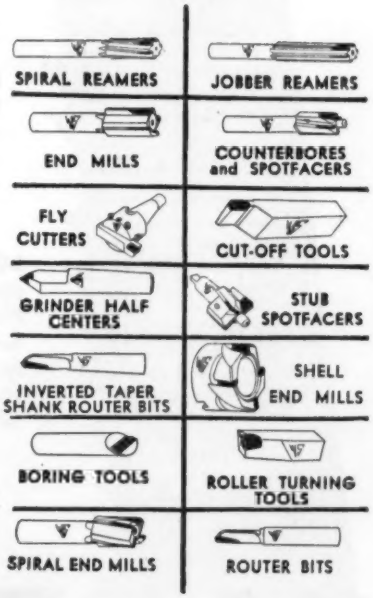
SPIRAL END MILLS. Right and left hand Spiral End Mills, Straight and Tapered Shanks. For cutting cast iron, steel and non-ferrous materials. Diameters ¼" to 2".

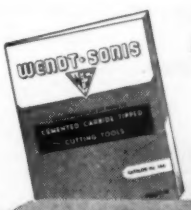
They're here! They're new! They're standard! These Wendt-Sonis cutting tools are especially designed carbide tipped cutting tools—not adaptations of high speed steel designs.

DISTINCTIVE CHARACTERISTICS—

1. *New flute angles*
2. *New fillet designs*
3. *New shank designs*

—plus 25% longer carbide tips on all round tools. All these new tools—many of which were formerly classed as "special" are now standard and listed in new W-S Catalog No. 144. Order through your nearest Wendt-Sonis distributor . . . or write to WENDT-SONIS COMPANY, Hannibal, Missouri or BRANCH WAREHOUSE, Long Beach, Calif.





NEW!

W-S Catalog No. 144 just off the press. Contains all new standardized tools and latest prices. WRITE TODAY for your FREE copy.

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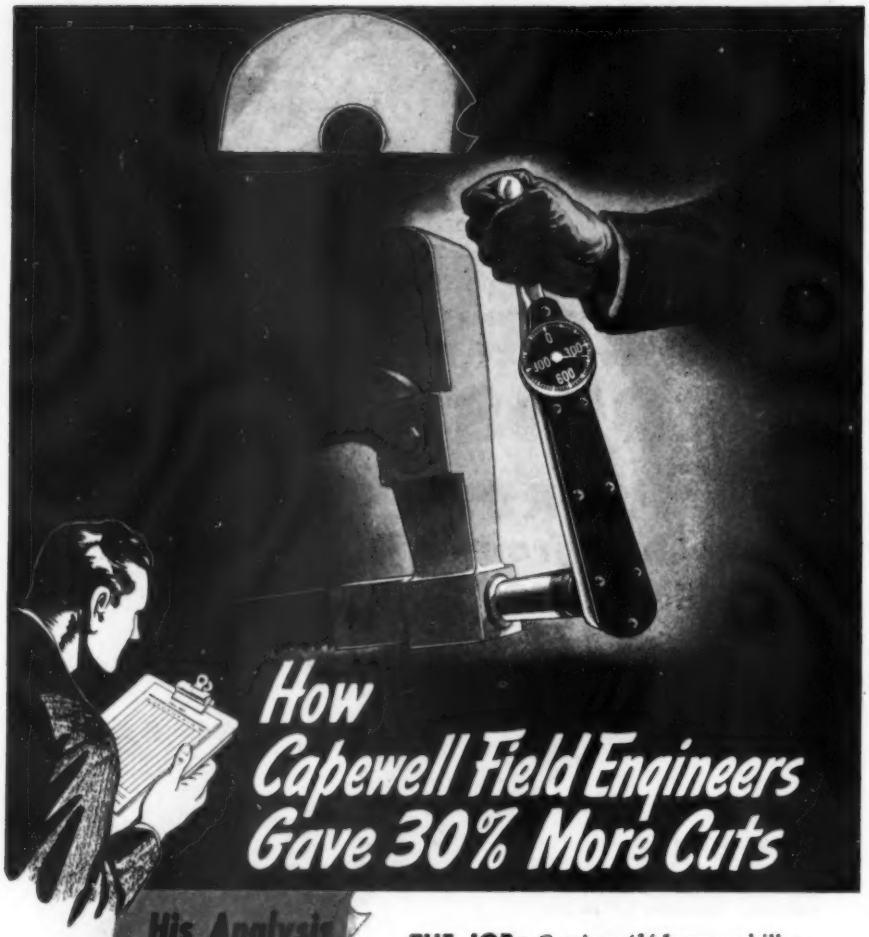
BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • ROUTER BITS • SPECIAL TOOLS



How Capewell Field Engineers Gave 30% More Cuts

His Analysis Covers:—

1. PRECISION TENSION

Nothing is left to chance. The Capewell Field Engineer checks tension with a precision instrument.

2. STUDY OF MATERIAL

It is his business to know how many steels act under the various Capewell Hack Saw Blades.

3. CORRECT TEETH

Variations in shape, size and physical properties of material call for different tooth specifications. Let him work out the proper specification for your job.

THE JOB: Cutting 4½" square billets, of special chrome tungsten alloy for propeller parts.

FORMER OUTPUT: 13 minutes per cut. 12 to 15 cuts per blade.

NEW RECORD: Capewell's Technite Hack Saw Blades, tested in rotation on four identical saws, reduced cutting time 40% to 7 to 9 minutes. Blade life increased to 20 to 25 cuts.

LOWER PRODUCTION COSTS result from the service of the Capewell Field Engineer. Such costs will take on new importance after the war. But now is the time to plan for lower costs. Have you looked into Capewell hack saw blades?

Ask your mill supply man

CAPEWELL HACK SAW BLADES

The Capewell Mfg. Co.
Hartford 2, Conn.

The trend is to TECHNITE, the molybdenum high speed hack saw blade

STEEL GRATING A book on the latest information on open steel grating and stair treads has been issued by Wm. F. Klemp Co., 6601 South Melvina Ave., Chicago 38, Ill. Illustrated with many installation photos, the book includes detailed construction particulars, drawings and tabular specifications and installation data for such services as open steel floorings, stairways, stair treads, loading platforms, decks for bridges and ships, catwalks, and similar installations.

TAPPING Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio, has issued two bulletins on tapping machines. One covers a complete line of precision tapping and threading machines in capacities ranging from 0-80 and 1½ in. in steels and 2½ in. in soft material. Complete specifications are given on each model. The other bulletin is on the No. 10 tapping and threading machine and it covers the features, construction, operation and complete specifications of this model.

V-BELT DRIVES Allis-Chalmers Mfg. Co., Milwaukee 1, Wis., has released Bulletin No. B6331, a quick-picture booklet which describes its line of V-belt drive equipment. Five special kinds of Texrope V-belts are reviewed as well as the new type Magic-Grip sheave and the four-speed changing methods used in Allis-Chalmers sheaves.

WELDING In "Sew With Steel" Hobart Brothers Co., Hobart Square, Troy, Ohio, discusses the Hobart arc welder and its many applications on jobs requiring the joining of metals. For each suggestion, the booklet shows a typical installation photo of the unit at work. Among the projects illustrated are sheet metal fabrication, oil pipes, tunnels and subways, housing and construction, ship building, aircraft production and many others.

NEW BOOKS

WARTIME DATA SUPPLEMENT TO THE AMERICAN MACHINISTS' HANDBOOK—*By Fred H. Colvin and Frank A. Stanley. Published by McGraw-Hill Book Company, 330 West 42 Street, New York 18, N. Y. Price $1.*

In a 150-page booklet, by the authors of American Machinists' Handbook, many wartime advancements in metalworking are covered, as are the problems involved in working with substitute materials. It can be used effectively in conjunction with the latest editions of the handbook itself.

Divided ino nine chapters, the Supplement covers materials, screw threads, drilling, cutting tools, grinding wheel markings, gearing, metal forming and welding in aircraft work, inspection and metal cutting saws.

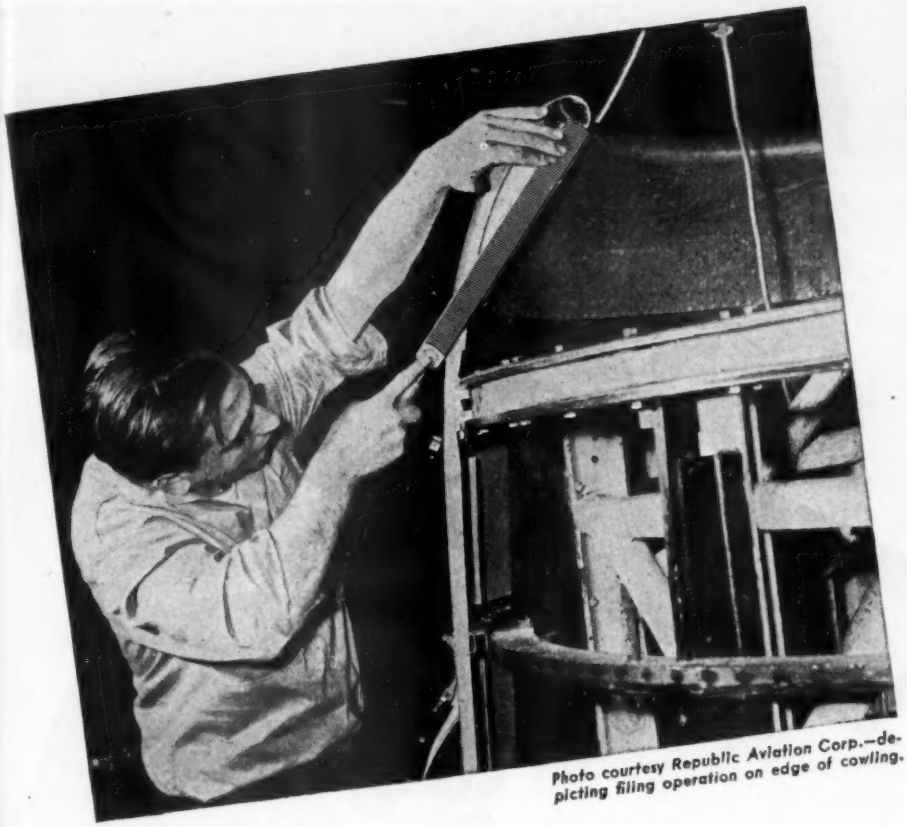


Photo courtesy Republic Aviation Corp.—depicting filing operation on edge of cowling.

SAYS a spokesman for the builders of the famous *Thunderbolt* fighter: "Our plant uses Nicholson Files extensively and in wide variety — as is natural where many types of materials are used, and die-making, fabricating, assembling and tool maintenance demand many kinds of filing operations."

When it comes to providing *The right file for the job,* there is no better source than Nicholson. In addition to manufacturing the hundreds of established kinds, cuts and sizes of files, Nicholson is constantly studying new developments — in metals, alloys, shop practices, production methods — in which new types of files may prove helpful.

For example: The extensive use of aluminum and kindred alloys for aircraft dies and structural parts led to important Nicholson improvements in Milled (curved) Tooth Files. Special files for stainless steel, die and foundry castings, brass, lead, and lathe filing are further Nicholson contributions to greater filing speed, better work, lower production costs.

Nicholson service is always available toward solving unusual filing problems; while the Nicholson factories are striving resolutely to maintain adequate supplies of *all* kinds of files for today's essential needs. Mill-supply houses will co-operate to the utmost on your requirements.

FREE—*"FILE FILOSOPHY"*—48 pages. Invaluable to purchasing and production heads, foremen, key mechanics.

NICHOLSON FILE CO., 29 Acorn St., Providence 1, R. I., U. S. A.
(Also Canadian Plant, Port Hope, Ont.)

NICHOLSON FILES FOR EVERY PURPOSE NICHOLSON U.S.A.

TAFT-PEIRCE *Cemented Carbide* GAGES

Taft-Peirce Thread Plug Gage. Threads is ground into solid tungsten carbide members on cylinders.

. . . an extensive line developed over the past 6 years

All Taft-Peirce thread plug, cylindrical plug, adjustable snap and cylindrical ring gages . . . as well as many special gages . . . can be furnished with wear-surfaces of tungsten carbide, tantalum carbide, and like materials of extreme hardness. The exceptional wear-resistance of these cemented carbide surfaces means greatly increased gage life, and sharply decreased gaging costs. Send your inquiries and specifications to the *Small Tool and Gage Division* of:

THE TAFT-PEIRCE MANUFACTURING CO.

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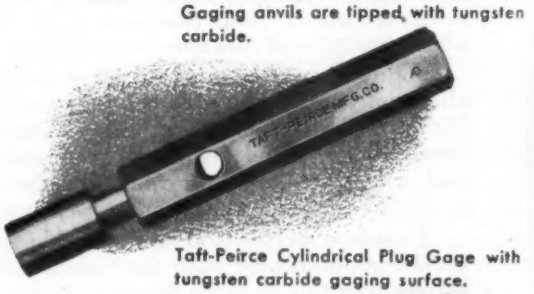
T-P

Use T-P Gages for every Gaging Need

Taft-Peirce Plain Adjustable Snap Gage. Gaging anvils are tipped with tungsten carbide.



Taft-Peirce Cylindrical Plug Gage with tungsten carbide gaging surface.

Taft-Peirce Go and Not Go flat plug or paddle gage with tungsten carbide gaging surfaces.

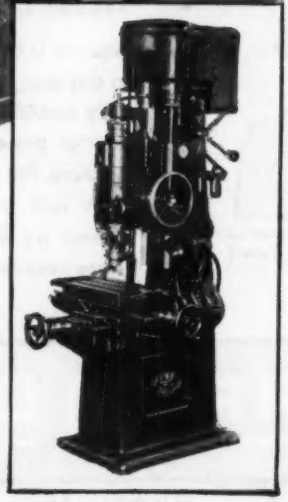
Multi-Section Hole Grinding in One Simple Set-up

Looking at this 10 station progressive die with 100 holes to be located and ground to .0002" tolerance in the die and stripper inserts, you'd hardly call this a single set-up job. But that's what it is on the Moore Jig Grinder.

For on this unique machine *all the sections can be screwed and doweled into place, strapped on the table and ground in one set-up*...eliminating separate section hole grinding and the accompanying difficulty of accurately locating each section in the die bed.

Hardening distortion is quickly and accurately corrected. The Jig Grinder relocates holes, finish-grinds them—straight or tapered, within .0001"—removes the decarburized surface and produces a smoother finish. All this in *one-third* the time required by previous, more costly methods. And more uniform clearance between punch and die adds from 25% to 100% to the life of a Moore jig-ground die.

You'll want to know more about what this machine can do for you, why it is considered a toolmaker's "must," how the Moore Jig Grinder put die-making on an interchangeable parts and assembly basis. So why not write today for our technical bulletin.



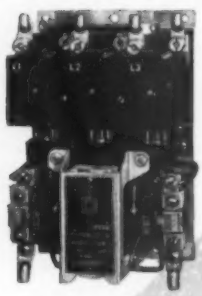
MOORE SPECIAL TOOL CO., INC.
738 UNION AVENUE, BRIDGEPORT 7, CONN.

MOORE TOOLS

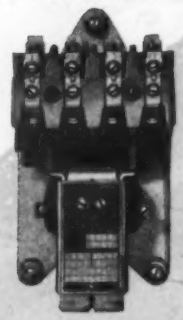
MOORE Jig Grinder

THE ONLY MACHINE OF ITS KIND

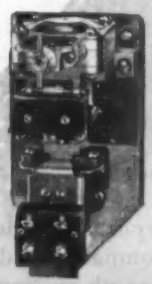
Square D HAS FOR MODERN, EFFICIENT



Vertical action magnetic starter, 50 ampere size

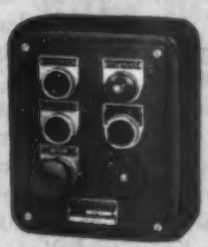


Four pole, Type R control relay or 15 ampere contactor

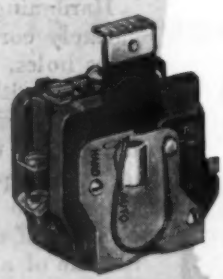


Type R pneumatic timing relay. Range .2 second to 3 minutes

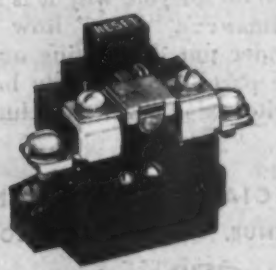
Heavy duty precision limit switch for machine tool service



Cast-iron control station using gasketed, drip-tight control units



New Type AR automatic hand reset overload relay with adjustable trip setting



Standard melting alloy type thermal overload relay

Field Engineering Service in nearly 50 principal U. S. and Canadian Cities

MAGNETIC STARTERS and CONTACTORS

Vertical action type, designed specifically for the exacting requirements of machine tool control. Double break, **silver to silver** contacts require no cleaning or dressing. **Complete** accessibility of terminals and parts facilitates **installation** and maintenance. All renewable parts, including magnet coils and contacts, can be inspected or replaced in a matter of seconds, using only a screwdriver, and without disturbing connections or removing the unit from the control panel.

OVERLOAD RELAYS

Exactly the right overload protection can be obtained by using the proper member of one of Square D's four "families" of overload relays. Available in a wide range of ratings are: melting alloy type, nontamperable relays; bimetallic type adjustable relays; adjustable oil dashpot type magnetic relays; instantaneous trip magnetic relays.

ACCESSORIES

Square D offers many complete lines of accessories for machine tool control. In addition to conventional push-button stations, gasketed drip-tight control units and cast-iron multiple unit stations are available. Other accessories include two lines of precision limit switches, pneumatic timing relays, and terminal blocks.

FIELD ENGINEERING SERVICE

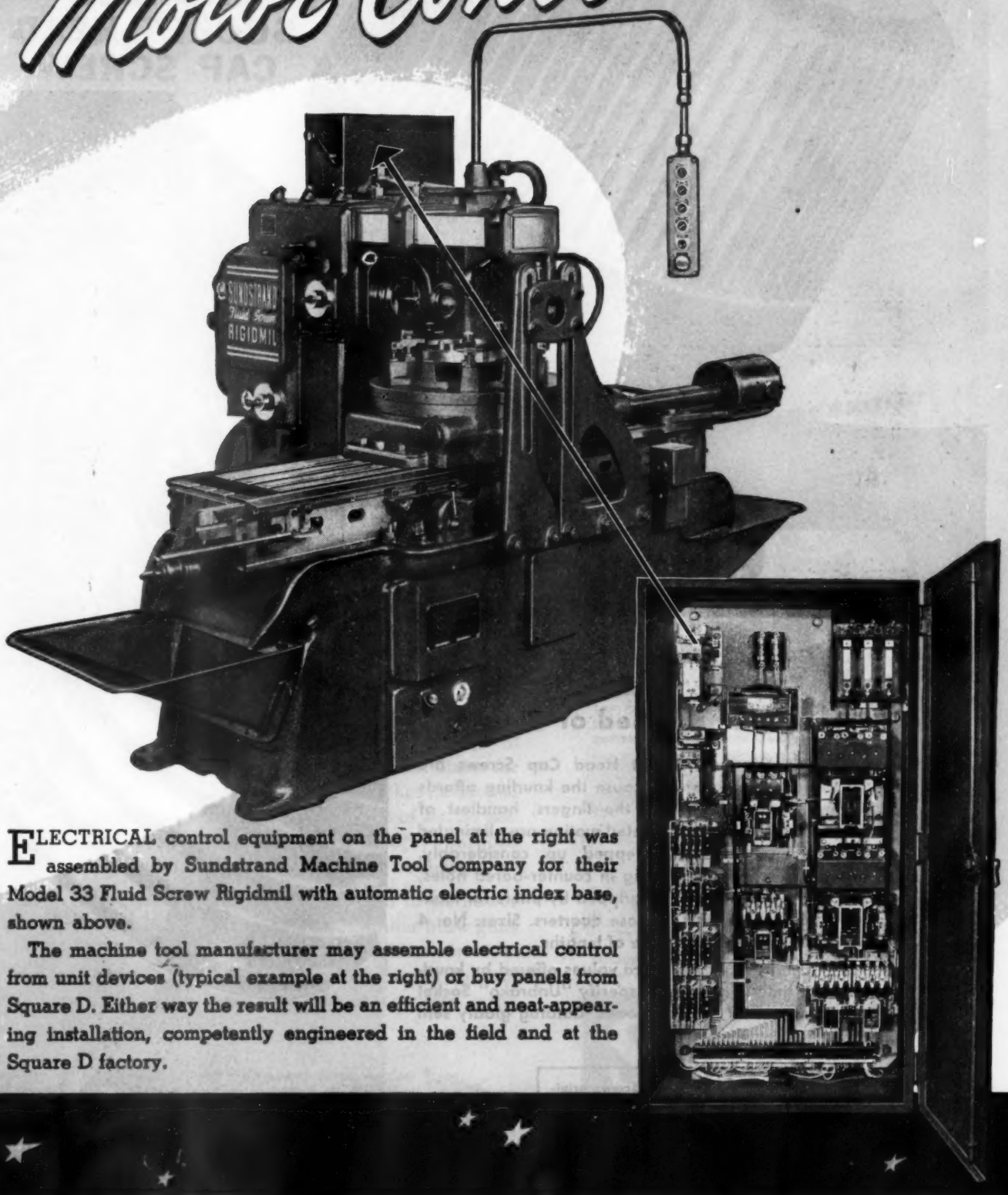
Square D Field Engineers have had years of experience in designing electrical control for machine tools. They are fully qualified to select the correct equipment for machine control panels, and to work out line diagrams of connections for desired operation sequences. Their suggestions and proposals are carefully analyzed and confirmed by factory engineering departments with complete research and testing facilities at their command.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

THESE INGREDIENTS

Motor Control



ELECTRICAL control equipment on the panel at the right was assembled by Sundstrand Machine Tool Company for their Model 33 Fluid Screw Rigidmil with automatic electric index base, shown above.

The machine tool manufacturer may assemble electrical control from unit devices (typical example at the right) or buy panels from Square D. Either way the result will be an efficient and neat-appearing installation, competently engineered in the field and at the Square D factory.

UNBRAKO

Reg. U. S. Pat. Off.

KNURLED SOCKET HEAD CAP SCREW

THE UNBRAKO

Reg. U. S. Pat. Off.

IS KNURLED

for ease and speed of assembly

Knurled "Unbrako" Socket Head Cap Screws are preferred by mechanics because the knurling affords a firm, non-skid grip for the fingers, handiest of wrenches. Lost time and wasted motion are eliminated and assembly thereby stepped up considerably. Knurling also permits locking in counter-bored holes, and *knurled* heads can be gripped by pliers for making minor adjustments in close quarters. Sizes: No. 4 to 1 ½" diameter. Full range of lengths.

Take advantage of the *extra* values offered by knurling next time you order — specify "Unbrako" Socket Cap Screws with *Knurled* Heads. Catalog gladly sent upon request.

Knurling of Socket Screws originated with "Unbrako" years ago.

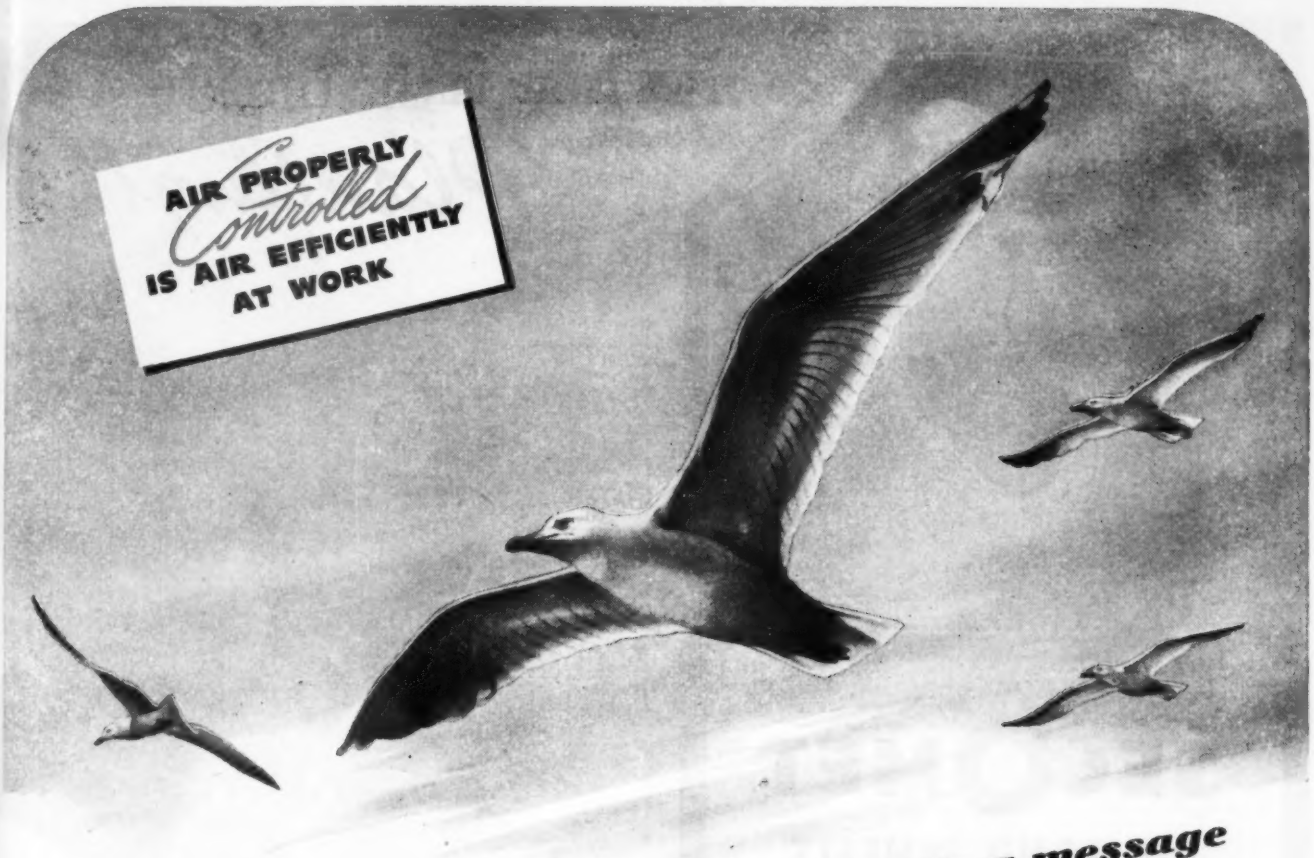
STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 4

BRANCHES

BOSTON • DETROIT • INDIANAPOLIS • CHICAGO • ST. LOUIS • SAN FRANCISCO

OVER 40 YEARS IN BUSINESS



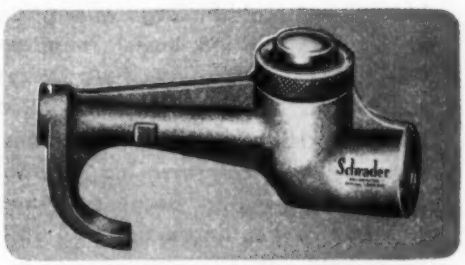
though he's not a carrier pigeon, there's a message "up his sleeve"

You are looking at a bird who knows how to go places and do things with natural air.

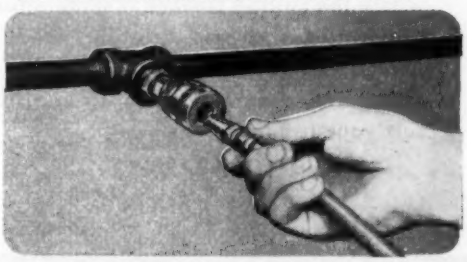
You, too, can do many things with air... compressed air. And you can do them cheaply, quickly, safely, and effectively if that air is properly controlled.

Years ago, Schrader dispelled the old bugaboo of air losses, substituting controlled, intermittent blasts for wasteful constant flow. Since then Schrader has developed hundreds of devices for the control and use of air. So saving are these devices that you can often multiply your jobs for air *without* adding to your compressor capacity.

Two of the many Schrader contributions to air power are Blow Guns and Air Couplers. All Schrader blow guns and air couplers shut off automatically and instantly when released, conserving high pressure air. For all the advantages of Schrader blow guns and air couplers, write in for Bulletin A-12A.



TOP: Drop forged stainless steel blow gun, one of numerous Schrader types. Drop-tested from 11-story building for ruggedness. 8 different interchangeable noses available.



BOTTOM: Schrader Heavy Duty Air Line Coupler, quick acting, air tight, automatic shut-off.

100th ANNIVERSARY 1844 1944

Air Valves 2, 3, 4-way • Machine Operating Air Controls • Quick-acting Couplers • Blow Guns • Safety Operating Controls • Air Ejection Sets • Hydraulic Gauges

ARMY NAVY

MADE BY THE MAKERS OF SCHRADER TIRE VALVES AND GAUGES

Schrader
REG. U.S. PAT. OFF.
CONTROLS THE AIR

A. SCHRADER'S SON, *Division of Scovill Manufacturing Company, Incorporated*, BROOKLYN, NEW YORK

SECOMET
DIAMOND WHEELS

Resinoid-bonded **for grinding of carbide-tipped tools in large quantities, or on a production basis. Their extremely fast cutting action provides rapid stock removal. Also for fixed feed, precision grinding operations, such as cylindrical, surfacing, internal and cutter grinding, because of their free and cool cutting action and ability to hold size.**

Metal-bonded **for off-hand grinding, where the cutting surface is sometimes subjected to extreme abrading action.**

Made in all standard types and diameters, in diamond concentrations to suit your requirements.

Catalog on request.

J. K. SMIT & SONS

157 Chambers St., New York 7, N.Y. 6400 Tireman Ave., Detroit 4, Mich.

SUPER MATERIAL IGNIS TRIUMPHANS

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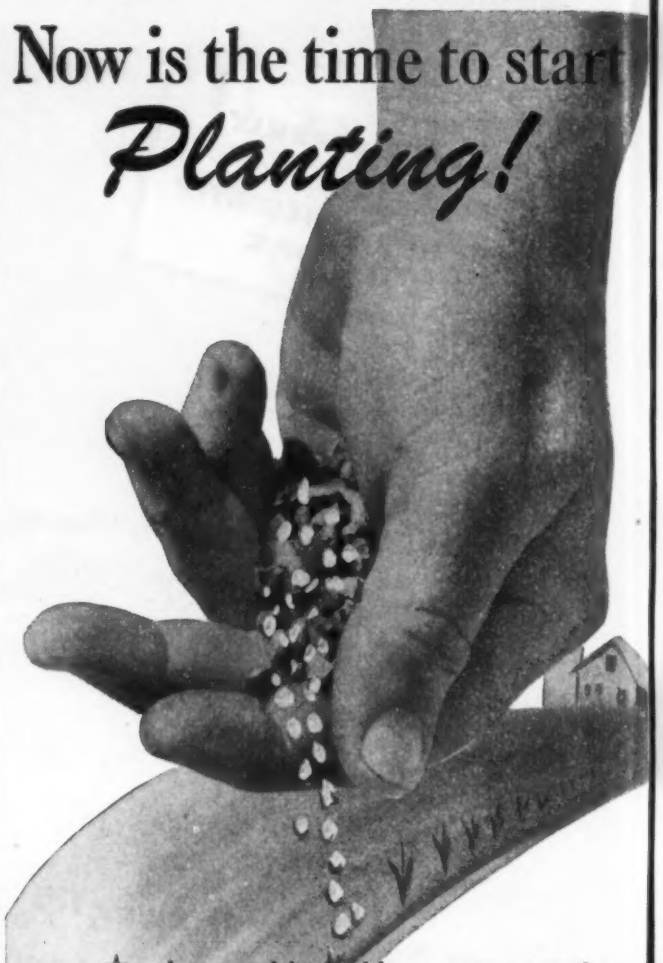
Now is the time to start *Planting!*



☆ and any seed for healthy post-war growth must include the new elements that contributed so much to victory.

OH-38 Aluminum Alloy—an exclusive Hedstrom product—has proven its superiority in hundreds of war products and permissible civilian items. You will want it for the component parts of your new and improved products—for parts that can be made better, faster, cheaper—with OH-38.

OH-38 is used only in castings by Hedstrom.

Send for complete technical information.

HEDSTROM

OSCAR W. HEDSTROM CORP.

4812 West Division St., Phone Columbus 3667, Chicago, 51, Ill

Manufacturers of Aluminum, Brass, Bronze and High Conductivity Copper Castings. Pattern Makers. Complete Mechanical Assemblies and Models to Specifications

MEEHANITE CASTINGS AT WORK

On the Invasion Fronts

Many of the pivot retainer castings of the Oerlikon Gun Mount are Meehanite Castings. This gun has been recently mentioned in Invasion Front dispatches.

Before acceptance, the Meehanite Castings were tested at Ordnance Proving Grounds. Below are direct quotations from the test reports:

"1st test: One casting was stood on end, and from a distance of 25 yards six rounds of .303 service ammunition were fired at it in two series of three, the castings being turned around for the fourth, fifth, and sixth rounds. Five dead-on hits were registered and one slightly to the right. Two hits were within 1/4 inch of each other.

"The casting was returned to the plant and examined. The bullet impressions were approximately 5/16" diameter, to a depth of about 1/100". No cracking around the dents was visible and no other damage could be found."

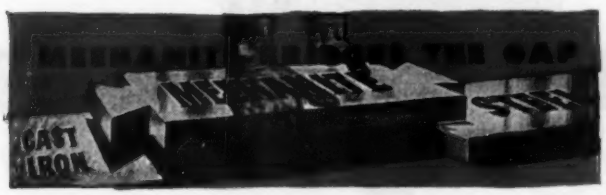
"2nd test: The second casting was dropped from a height of 17 feet upon a section of tank armor plate. The casting fell sideways and came in contact with the plate in two places—the flange and at the long end.

"The casting was later examined and found to have received no damage, with only slight markings where the casting struck the plate."

Such results reveal again the strength, toughness, and resistance to shock available in Meehanite Castings. For further information write for Bulletin No. 15 "Meehanite Castings in War Work."

MEEHANITE RESEARCH INSTITUTE

NEW ROCHELLE, NEW YORK



MEEHANITE QUALITY CONTROL ASSURES UNIFORM DEPENDABILITY

★ HELPING AMERICA PRODUCE MORE! ★

THAT'S WHAT NORMA-HOFFMANN FIELD ENGINEERS ARE DOING, TODAY

★ They're out on America's "production fronts," giving freely of their highly specialized experience, assisting manufacturers of armament, equipment, munitions and supplies in keeping production lines moving. They're aiding MACHINE BUILDERS to apply anti-friction bearings more economically and efficiently. They're helping MACHINE USERS to get the most from the bearings they have—to lengthen their life—to reduce shut-down hazards. At our factory, The Engineering and Research Departments are equally busy, solving problems in bearing application, operation and maintenance submitted by buyers of bearings in every field. And all this service is being rendered without cost, THAT AMERICA MAY PRODUCE MORE.

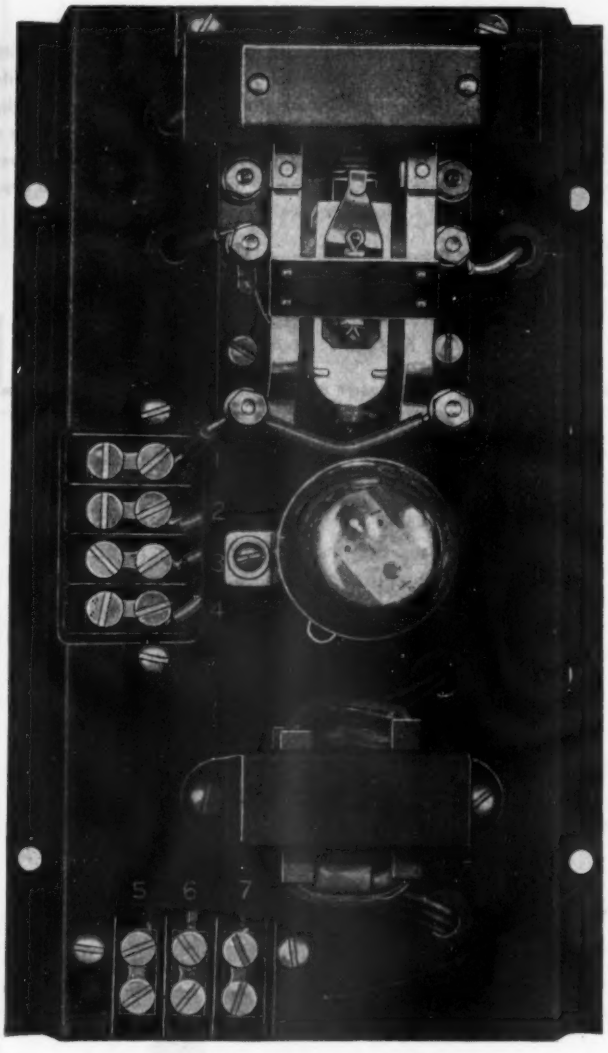
Write for the Catalog.
Let our engineers work with YOU.

NORMA-HOFFMANN BEARINGS CORP'N., STAMFORD, CONN., U.S.A.
PRECISION BALL AND ROLLER BEARINGS — FOUNDED 1911

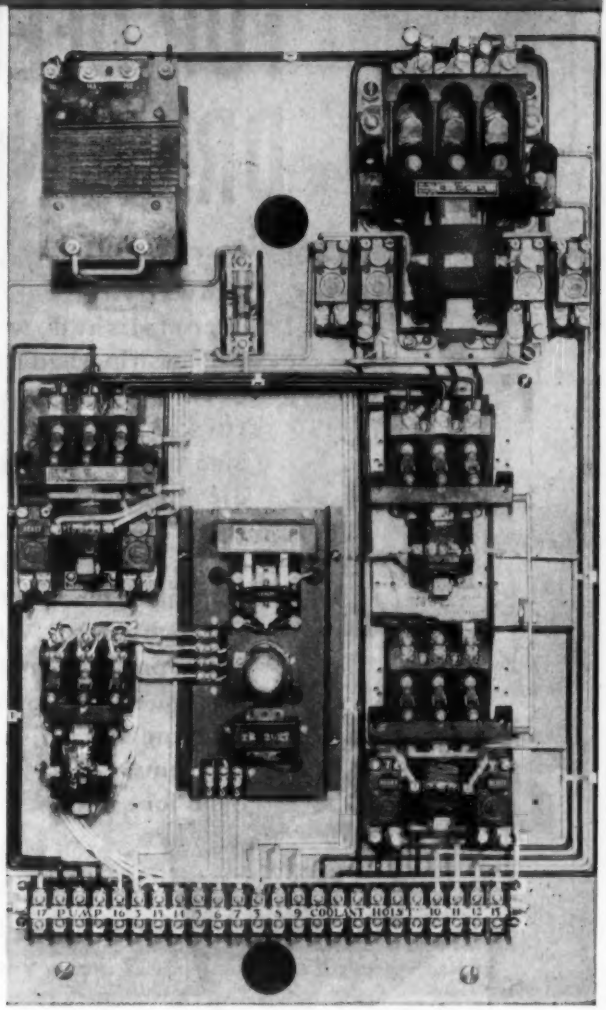
BUY MORE UNITED STATES WAR BONDS, TODAY

SURFACE GRINDER MAGNETIC CONTROL WITH ELECTRONIC TIMING

● The magnetic control equipment consists of individual magnetic starters providing overload and undervoltage protection for a 30 HP. spindle motor, 7½ HP. motor for hydraulic pump, 1½ HP. hoist motor, and ¾ HP. coolant pump motor. Control transformers and relays are also provided.



"3C" ELECTRONIC TIMER PANEL



"3C" CONTROL PANEL WITH ELECTRONIC TIMER

● The electronic equipment is a "3C" Bulletin 7313 type ET Electronic Timer specially designed to time the cross-feed of the grinder. Entirely automatic, it has a time range of 1/10 to 1 second, providing wheel feeds, adjustable up to width of wheel. This timer is built for a severe duty cycle —40 operations per minute, 24 hours a day.

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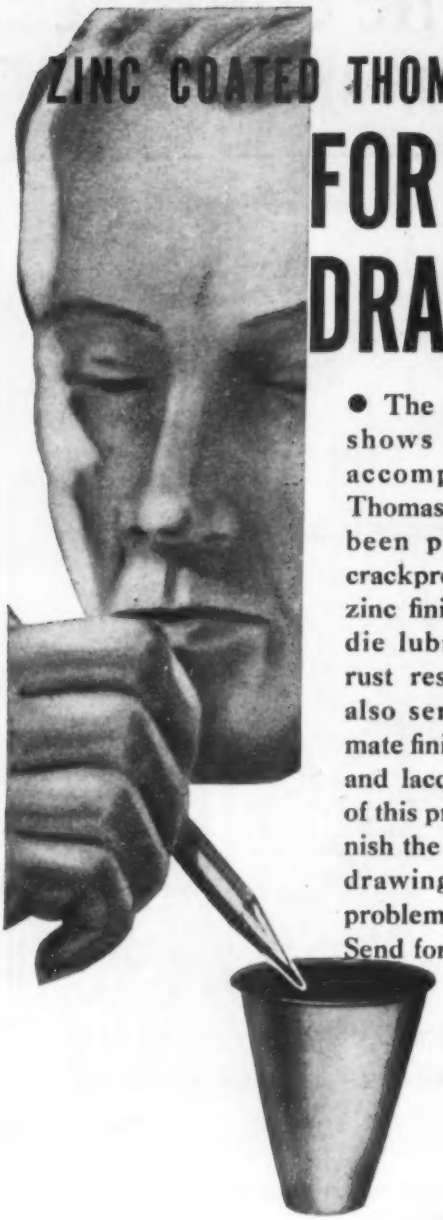

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FOR DEEP DRAWING

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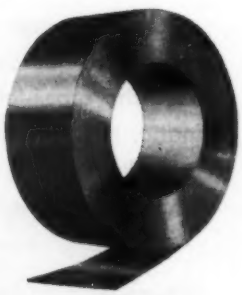

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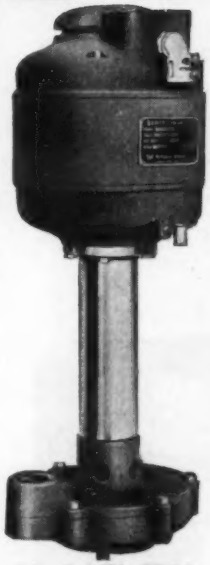

Model TL-7320
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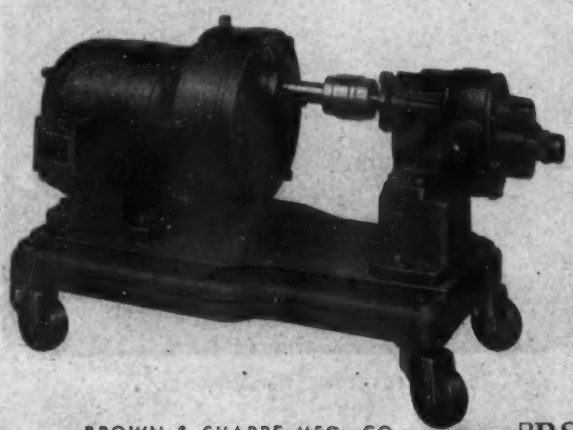

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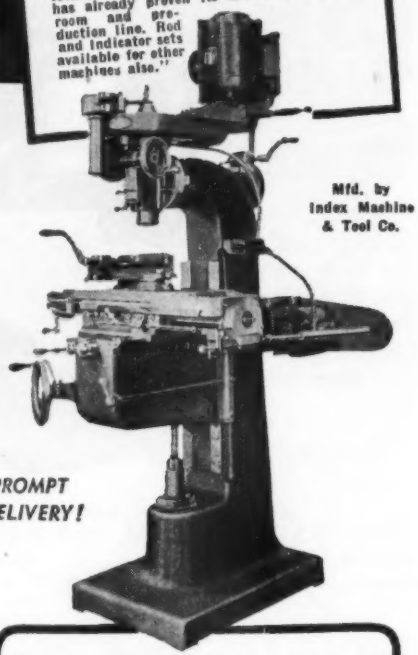

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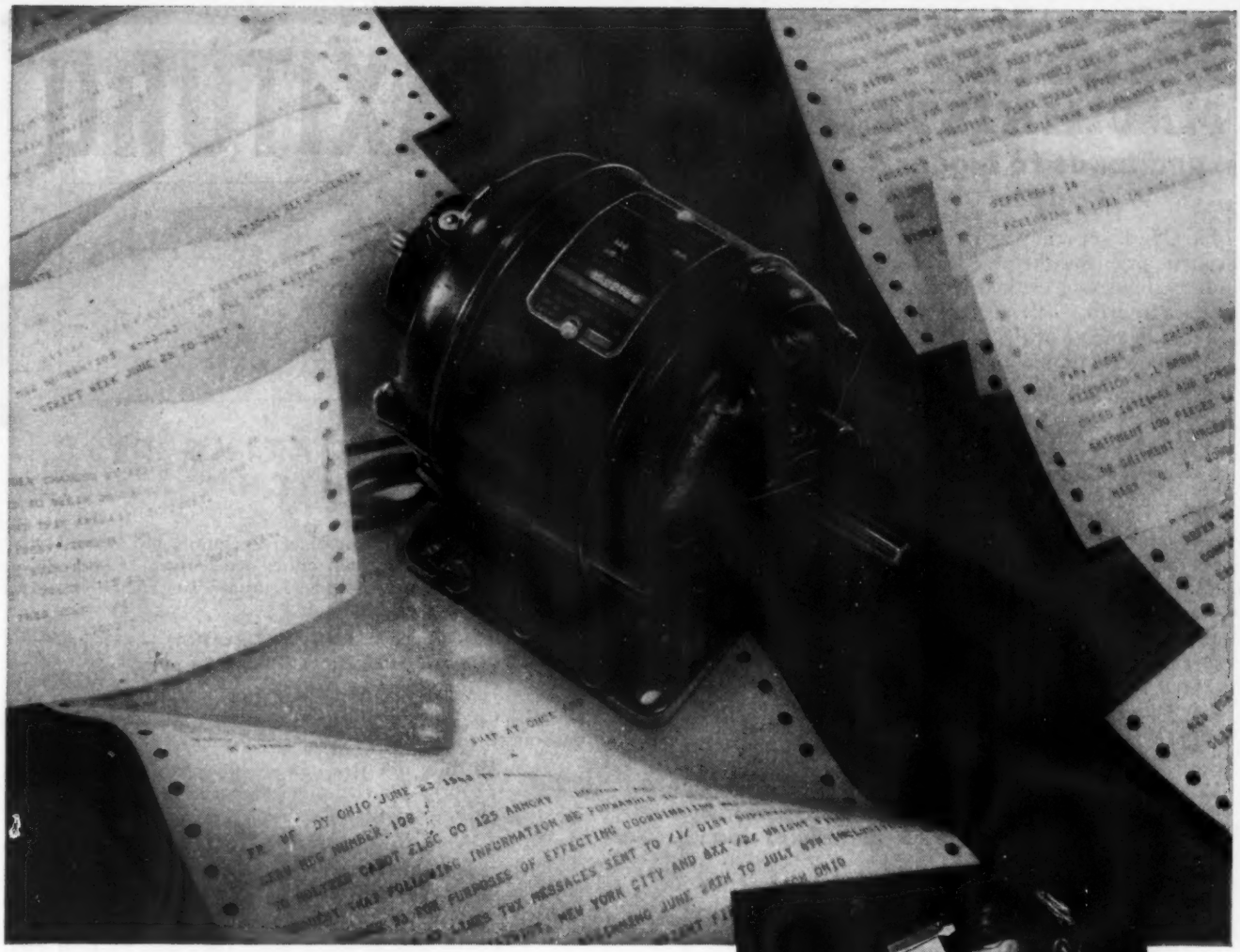

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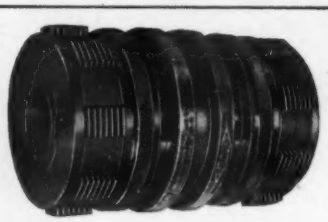

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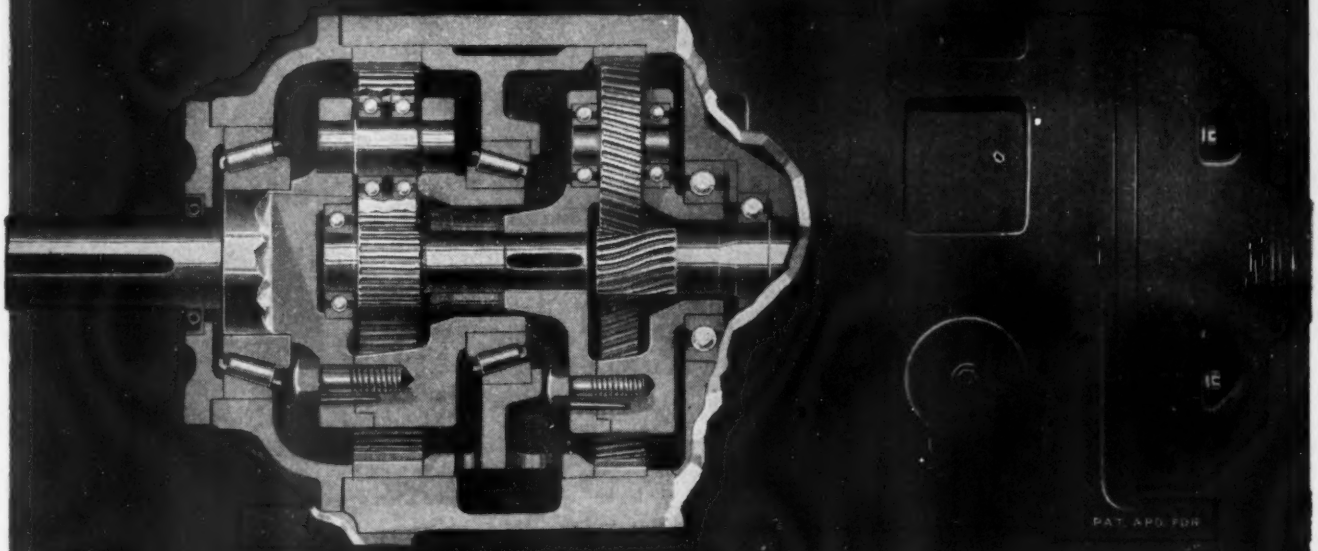

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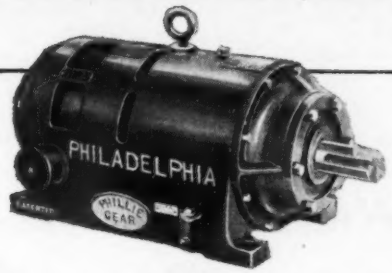

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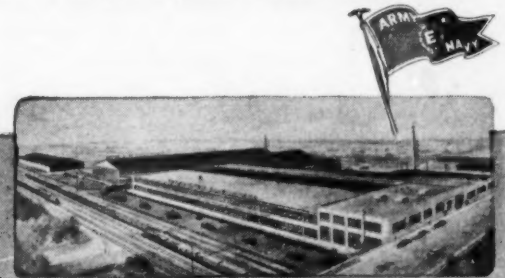

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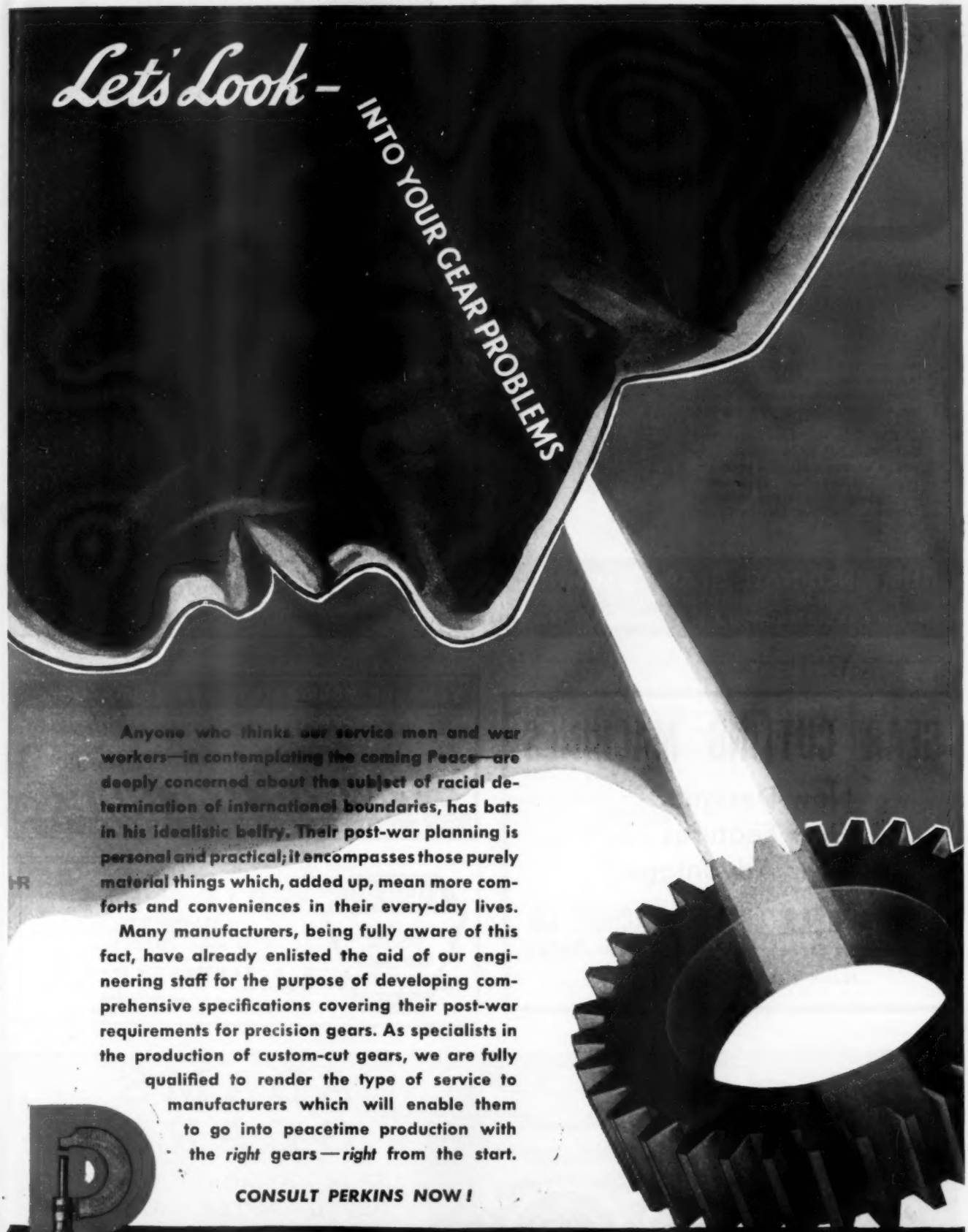

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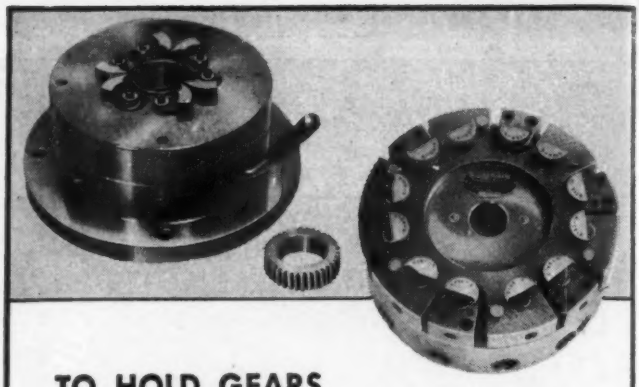

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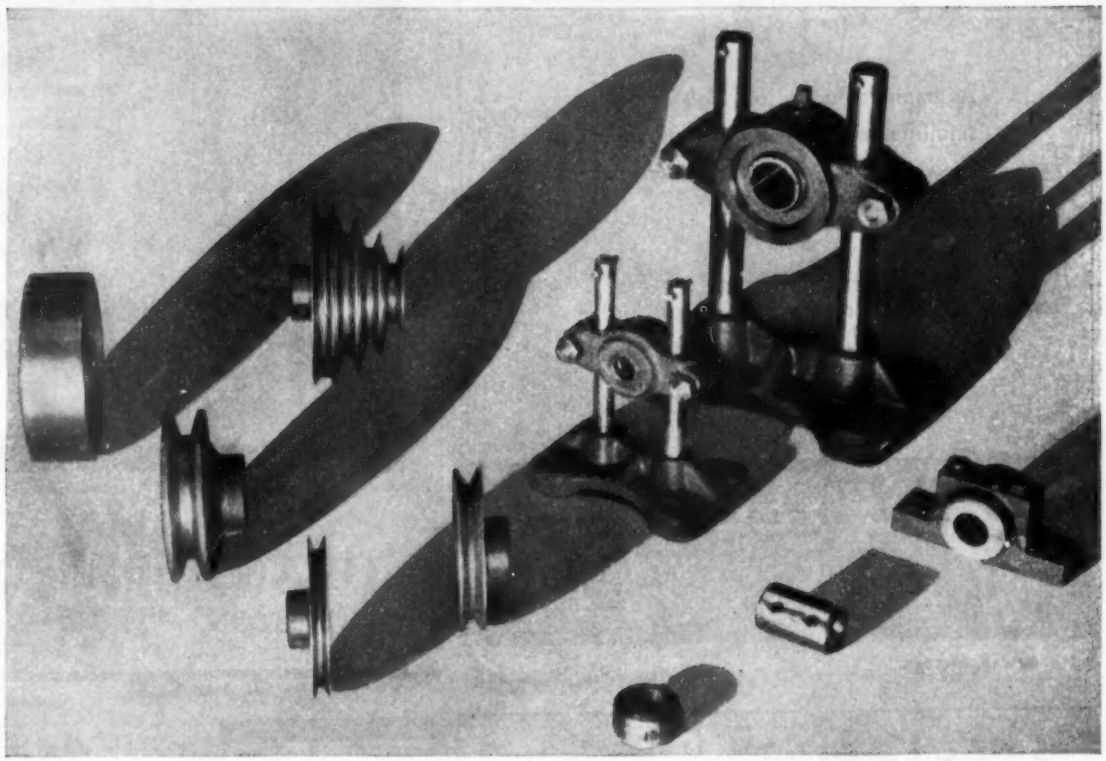

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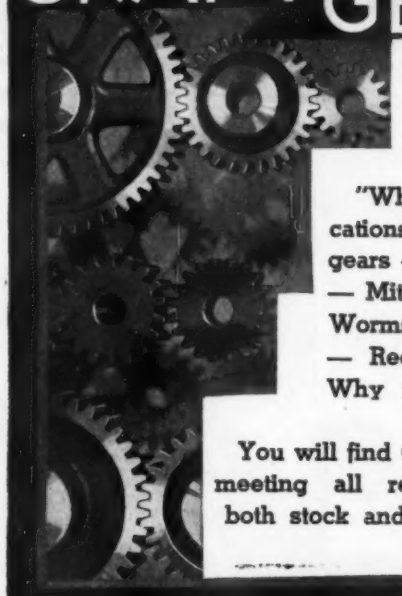

"When your specifications call for special gears — Spur — Bevel — Mitres — Helical — Worms and Worm Gears — Reduction Units — Why not try GRANT.

You will find GRANT service meeting all requirements of both stock and special gears."

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To do one thing *perfectly* rather than many things well is the sole objective of every MEISEL gear. And being constructed with only the requirements of a specific job in mind, MEISEL gears function at maximum efficiency always. Whatever your gear problem, investigate the advantages of *specifically* engineered gears by MEISEL.

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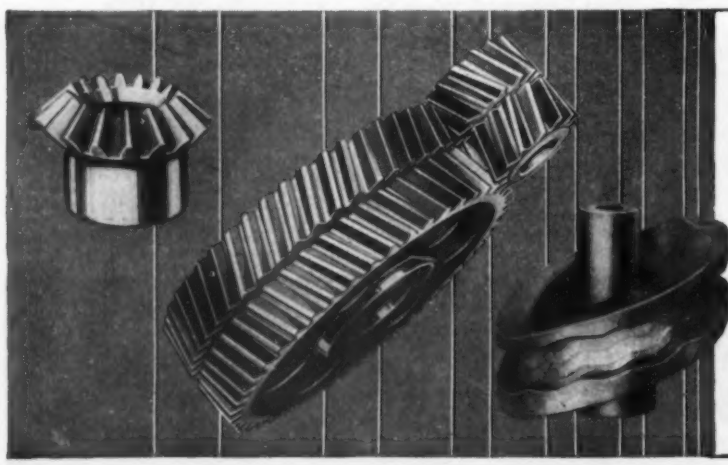

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GEARS of every description cut to order
GEAR, CAM and THREAD grinding
AERONAUTICAL PARTS on contract basis

Send blue prints or samples for estimate. Accuracy of work guaranteed to your specifications.

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The production lines of American Industry are behind the battle lines of the United Nations. Batteries of Niagara Presses and Shears are speeding up production of America's *SUPERFORTRESS* — Fastest of Bombers.

High output, convenient operation, reliability that reduces shut-downs to a minimum are performance factors resulting from Niagara design.

Niagara Presses and Shears are built in a complete range of well graduated sizes.

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ECONOMY and ACCURACY are the two factors to be considered when Die Cut Metal Stampings in limited quantities are needed. Our booklet, "Metal Stampings in Small Lots," will explain to you how accurate die cut parts can be produced at a very low cost.

Write for your copy of booklet No. 176-1

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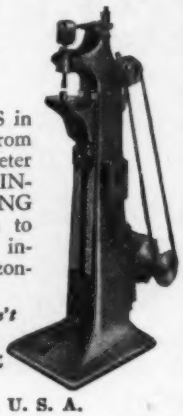
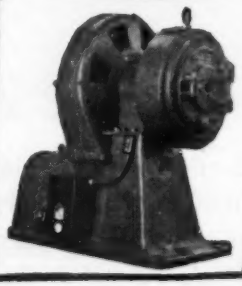
RIVETERS — PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

"Ask ETNA about Swaging"



● If you have a production phase that calls for tapering, sizing or reducing of solids or tubes, you can save money if you "ASK ETNA ABOUT SWAGING." The superior performance of ETNA machines assures you more pieces per hour at lower cost. Built in capacities of 1/8" to 4" . . . larger sizes built to order!

Ask for our swaging catalogs

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3400 MAPLEWOOD AVE. TOLEDO, OHIO

PICK UP YOUR 'PHONE and CALL "PRODUCTO"

Prompt Service at 5 convenient assembly plants

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Producto Die Sets and Accessories can be quickly assembled and shipped from any of the above five strategic points.

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For quick service get in touch with Bridgeport or Detroit.

Send for No. 9 Catalog giving complete specifications.

THE PRODUCTO MACHINE CO.
3017 Medbury, Detroit, Mich.
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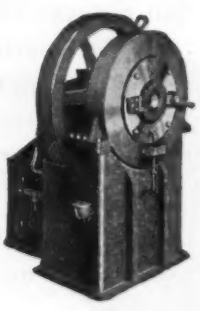

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SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

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Means Greater Accuracy In Your Production
Danly Commercial Sets
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DIEMAKERS' SUPPLIES

PAINTED BY DWIGHT MUTCHLER

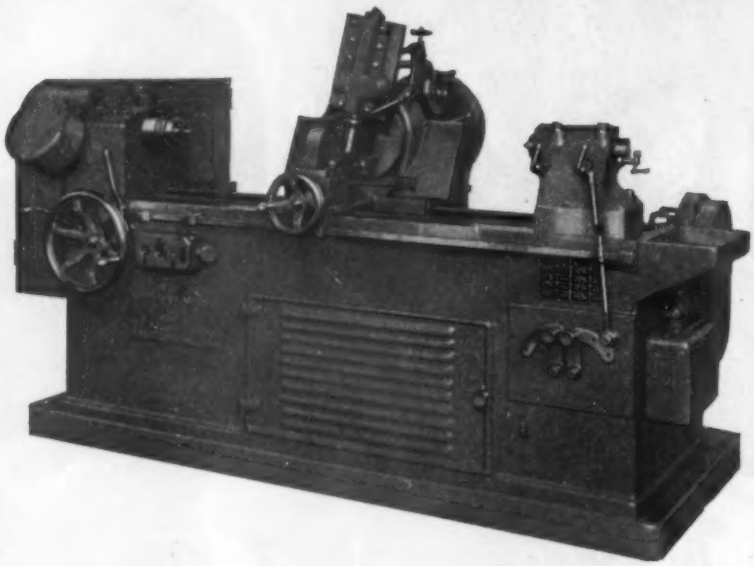
A CLOCK STARTED A REVOLUTION

Much more than a timepiece was set into motion in 1657 when Christian Huyghens applied Galileo's pendulum to a clock. This practical application of a scientific principle made possible precise, accurate measurement of time. It laid the ground-work for feats of navigation that revolutionized commerce; led to split-second timing so essential in today's machines and processes.

In modern industry, making a working proposition of the results of scientific research still brings about revolutionary changes. Take for example the way Clearing builds presses. The unhampered thinking of Clearing engineers and designers has time and again produced machines that do the seemingly impossible. A Clearing press answers the question, "How can it be done best?" rather than "How is it being done?"

When you seek accurate, high speed production with presses, look to Clearing for machines to carry out your ideas for the future. You'll find here the skill, imagination and production experience and facilities that can make your ideas pay. CLEARING MACHINE CORPORATION, 6499 West 65th Street, Chicago 38, Illinois.

CLEARING



The ADAMS Gear Hobber and Thread Miller

The Adams Manufacturing Hobber is available when there is a sufficient volume of splined shaft and spur gear hobbing to warrant the purchase of equipment for these operations only.

Here is a machine that combines precision with versatility. It hobs multiple splined shafts, spur gears and helical gears, and it will mill worm and screw threads.

THE ADAMS COMPANY

1905 BRIDGE STREET
DUBUQUE, IOWA, U.S.A.

1883 — Our 61st Year — 1944

TO KEEP SMALL JOBS FROM PILING UP

It's usual today for toolrooms to be clogged with a profusion of small but vitally important jobs. Too frequently it is necessary to schedule them on machines of larger capacity. This is expensive and it seldom relieves the situation.

The solution of this problem is an installation of the

LINLEY

HIGH SPEED VERTICAL MILLING AND JIG BORING MACHINE

There are 8 speeds from 275 to 4250 r.p.m., direct micrometer setting; velvet feed; no backlash of quill travel; table size 7" x 17½"; floor space 18½" x 20".

Clean up the little jobs . . . profitably, and let the LINLEY earn its keep.

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ACCURACY BOOSTS PRODUCTION

No. 1G	INTERNAL GRINDER	**No. 34**	VERTICAL SPINDLE SURFACE GRINDER
No. 1½	HAND FEED SURFACE GRINDER	**No. 3B**	AUTOMATIC FEED SURFACE GRINDER

Look for Our Full Page Advertisements

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, RHODE ISLAND

NEW HEAVY DUTY GEARGRIND FORMED WHEEL GRINDER

GEARGRIND Type 24-48 handles either coarse or fine pitch gears with diameters up to 24", and 48" between centers. It is mounted on an extremely heavy base and the grinding wheel column is exceptionally rigid.

Production has been more than doubled with this machine, due to a combination of many advanced features which include much faster indexing, more rapid travel of the work table to and from the work, simplified push button controls and operator convenience.

The low base provides a low center line of the work. Work areas are painted spot light buff. The result is better visibility, easier, faster inspection, and increased safety for the operator.

GEARGRIND Type 24-48 is a noteworthy addition to our complete line of machines for the Formed Wheel Grinding of external and internal gears, external and internal involute splines, straight splines, serrations and racks. Catalog on request.

FEATURES

Indexing at both ends of stroke or tail stock end only.

Index cycle stop selection from 0 to 400, adjustable at any point in cycle.

Pre-determination of time for trueing wheel and automatic travel of grinding wheel carriage to wheel trimming position.

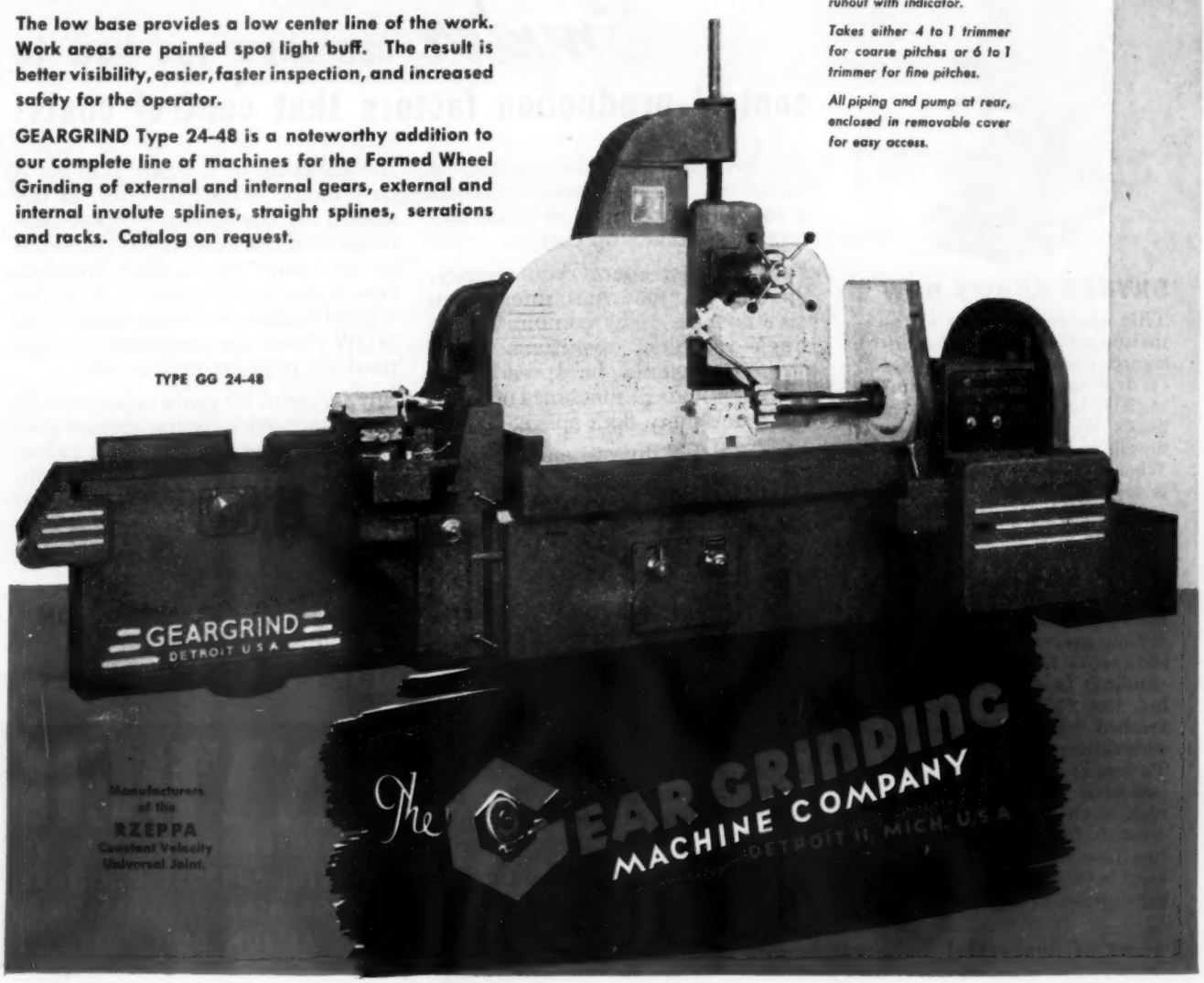
Electric safety circuit stops all carriage movement in case of index failure.

Motor driven work head spindle permits checking work runout with indicator.

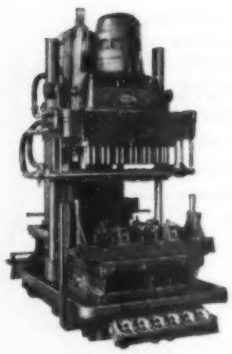
Takes either 4 to 1 trimmer for coarse pitches or 6 to 1 trimmer for fine pitches.

All piping and pump at rear, enclosed in removable cover for easy access.

TYPE GG 24-48


GEARGRIND
DETROIT U.S.A.
Manufacturers of the RZEPPA Constant Velocity Universal Joint.
The GEAR GRINDING MACHINE COMPANY
DETROIT 11, MICH. U.S.A.

GIVE YOURSELF A "BRAKE" ON POSTWAR PRODUCTION COSTS!



Snyder can show you how to control production factors that control costs!

SNYDER KNOWS HOW

This special-purpose automatic-cycle machine was designed and built by Snyder for drilling and precision reaming 24 holes in aircraft cylinder heads. Work is located on two dowels and clamped manually. When the cycle starter button is pressed the machine automatically goes through a complete work cycle as follows: Fixture moves into first working position, shot pin locates fixture and slide accurately, head is released and performs drilling operation, fixture and slide move from first position (drilling) to second for reaming, the 24 drilled holes are finished reamed, fixture and slide return to unloading stop. To assure precision reaming, two vertical guide bars (with rack teeth engaging a pinion cross-shaft) extend from fixture base to head casting and keep both ends of head moving downward in parallel.

The best way to "give yourself a brake" on postwar production costs is to establish control of those factors which make up cost.

Factory floor space costs money. Special-purpose machines often save floor space by combining in a single machine, operations which ordinarily would be spread over several standard machines occupying much more floor space.

Machine tool investment often can be reduced through the use of special-purpose machines performing multiple operations and eliminating the need for "batteries" of standard machines.

Production rate can be controlled through the automatic time cycle which is a feature of many special-purpose machines. The rate is set to meet your requirements.

Quality can be controlled by means of devices which automatically maintain specified tolerances and finish. Rejects and scrap are minimized.

Tool cost can be controlled through automatic operation which reduces the element of human skill as a cost factor. That, in brief, is the reason for the special-purpose machine and because it makes sense to so many production minded, cost-conscious executives, it is also a good reason for doing something NOW about the machines you will need for postwar production.

Snyder, with 20 years experience in designing and building special-purpose machines for American industry is ready to consult with you. We invite you to write in full confidence. *Snyder Tool & Engineering Company, 3400 E. Lafayette, Detroit 7, Michigan.*

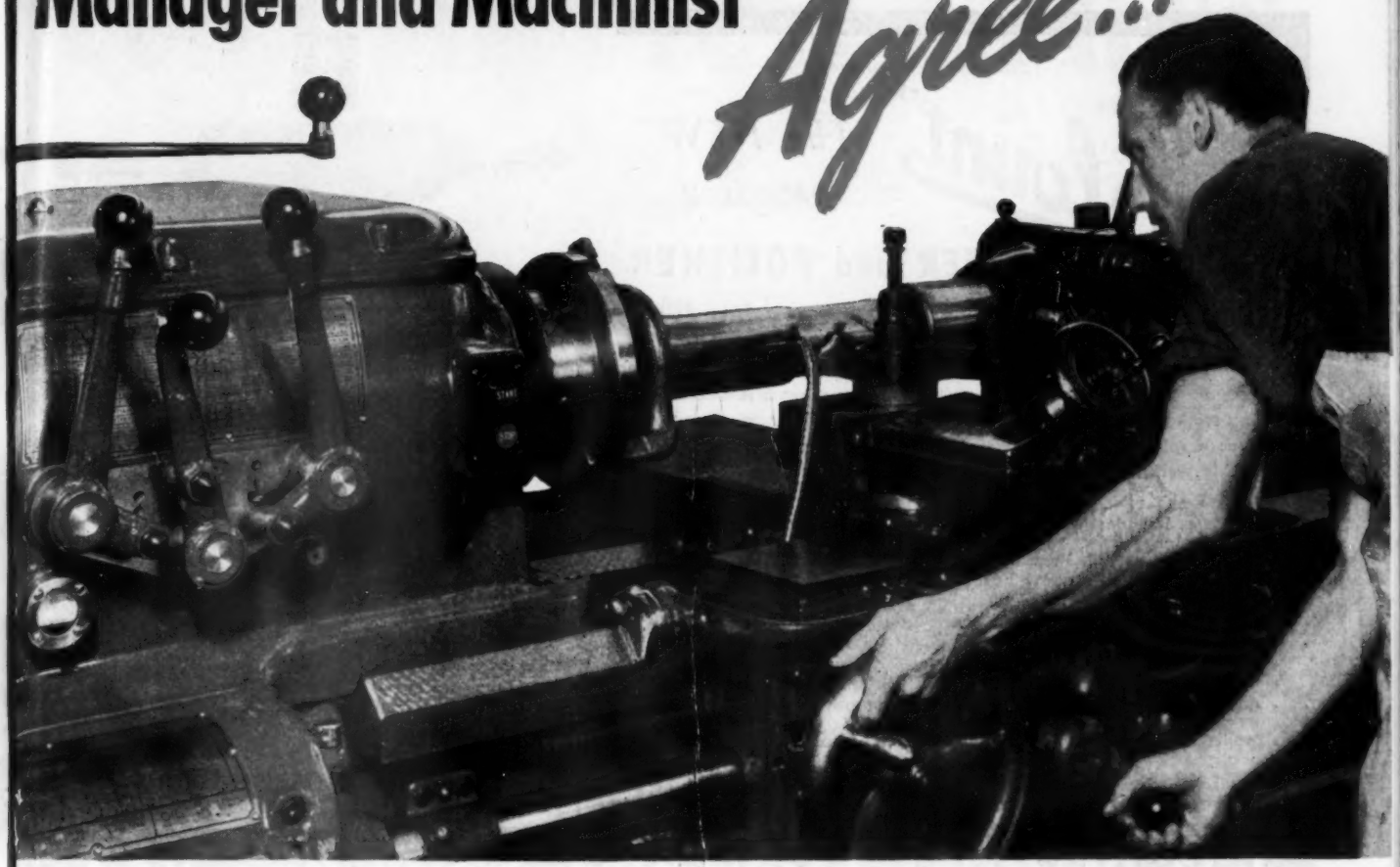
PLAN Your PRODUCTION when you PLAN Your PRODUCT

SNYDER

DESIGNERS AND BUILDERS OF SPECIAL-PURPOSE MACHINES FOR HIGH PRODUCTION AT LOW UNIT COST

20 years of Successful Co-operation with Leading American Industries

Manager and Machinist *Agree...*



It's AXELSON LATHES for the tough jobs!

Men who operate Axelson Heavy Duty Lathes know that these machine tools are "tops" in performance. Ease of operation, versatility and accurate action—on the heaviest roughing cut or the finest precision work—has won the approval of every machinist from the old-timer down to the newest hand.

Production managers too, who must watch per-piece cost and avoid rejects, know that Axelson Lathes merit complete confidence. Built-in quality and reliability are demonstrated by hundreds of plant operators who have specified Axelson Lathes for years, and who are still coming back for more.

Thirty years of dependable machine tool building experience have made Axelson Lathes the leader in smooth, fast accuracy on *any* turning job.

Learn how Axelson Lathes can *up* production for you. Write for Bulletin 4401 today.

AXELSON MANUFACTURING COMPANY

6160 S. Boyle Ave. (P.O. Box 98, Vernon Station), Los Angeles 11, Calif. • 50 Church St., New York City 7 • 3844 Walsh St., St. Louis 16, Mo.

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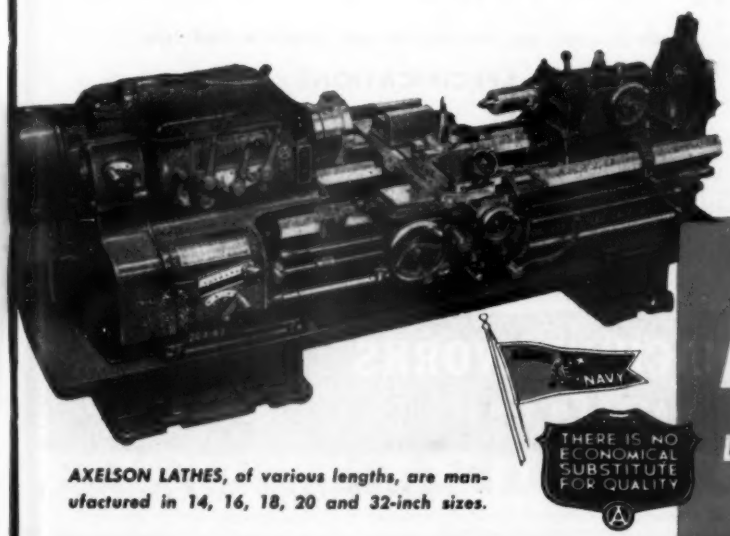


***AXELSON LATHES**, of various lengths, are manufactured in 14, 16, 18, 20 and 32-inch sizes.*

AXELSON LATHES

Dependable for over a Quarter Century

"Blount" The NEW MODEL K BUFFER and POLISHER

Speeds production through easy handling

This new Blount contribution provides offset wheel shafts and overhang toward operator, making it easy to work at. Plenty of room is available for swinging work to be polished. Fewer parts requiring attention assure easy operation; ample foot room reduces fatigue by enabling operator to stand erect at his work; streamlining simplifies cleaning.

Other features include:

. . . heavy rigid, smooth base construction.
. . . motor mounted in air-flow base; special enclosed or drip-proof motors not required.
. . . easily accessible and adjustable V-belt drive completely enclosed for maximum safety within column.
. . . spindle lock for holding spindle when changing wheels.
. . . positive grease-sealed bearing assemblies.

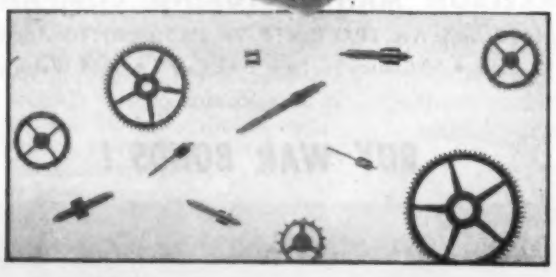
COMPLETE DETAILS AVAILABLE ON REQUEST

CONDENSED SPECIFICATIONS . . .

Height floor to spindle center—38"
Spindle length overall—53"
Spindle extension, each side—10¾" (optional)
Spindle bearings—Simplex "Cartridge-Type"
Spindle revolutions (optional)
Motors—2, 3 and 5 H.P.
Base 28" x 24"

J. G. BLOUNT COMPANY *Everett, Mass., U.S.A.*

WALTHAM PINION and GEAR CUTTERS



Produce Small Parts to Tool Room Standards of Precision

These machines are designed for producing fine pitch gears and pinions such as are used in watches, instruments, time fuses, etc. They are sturdily built and have an unusual capacity for machines of this type.

Whether for cutting gears or pinions, the same process is used in WALTHAM machines. This feature involves the use of a revolving cutter making successive cuts on blanks held and indexed by the work spindle. Cutter spindle is designed for high speeds. Operation is extremely simple and requires no special skill to achieve speed and accuracy in parts production.

Made in single cut, multiple cut and magazine feed types.

SPECIFICATIONS

PINION MACHINES

Diameter capacity (approx.)—½".
Coarsest pitch (about) 32 D.P.
Strokes of work slide for pinions .25" to .45".
Strokes of work slide for stacked gears .85" to 1".
Bench space (countershaft drive) 19" x 18".
Bench space (motor drive) 26" x 25".

GEAR MACHINES

Pitch diameter, capacity 1½".
Strokes for work slide: .40", .65", 1.00", 1.25".

Send for literature giving complete details.

WALTHAM MACHINE WORKS

WALTHAM, MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

AUTOMATIC LATHES

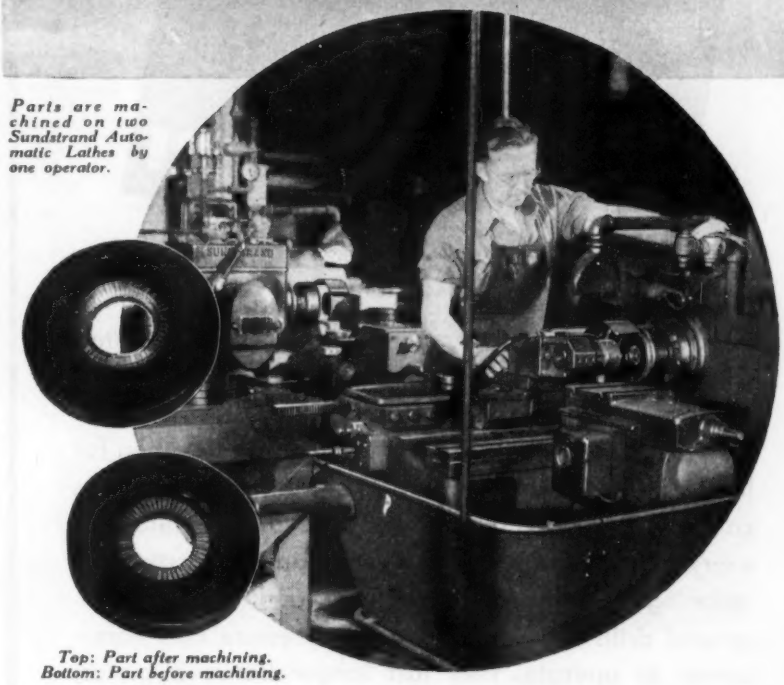
cut turning time *from 6 minutes to 29 seconds...* on copper commutator assembly

One Operator and 2 Sundstrand Machines Turn Out 12 Times Old Production Rate

Increased production of this part was required to eliminate a bottleneck in the manufacture of "dynamotors" by a well-known electrical firm. With the installation of Sundstrand Automatic Lathes, machining time has been cut from 6 minutes to 29 seconds on the operation illustrated.

The rough part consists of a commutator assembly composed of copper laminations separated by mica segments. As shown, it is required to bore a portion of the I.D., undercut the adjoining portion, break and form the corner and face the outer surface. The job was formerly handled on a high-speed engine lathe. Machining time ran 6 minutes per piece. Because of the manually controlled cycle, an operator was required for each machine. Multiple tooling and automatic cycling on two Sundstrand Model 8 Automatic Lathes now complete this job in a matter of 29 seconds per piece. One operator handles two machines, thus effecting a substantial savings in manpower.

Three high-speed tools, mounted in a special holder, are used on this job. Carbide tipped cutting tools are also commonly used on Sundstrand Automatic Lathes.



Parts are machined on two Sundstrand Automatic Lathes by one operator.

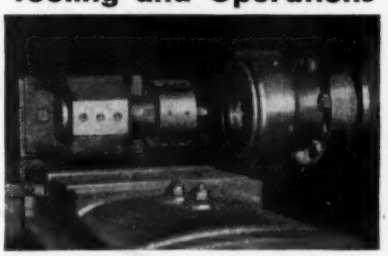
Top: Part after machining.
Bottom: Part before machining.

Here's What Sundstrand Automatic Lathes Can Do for You on Both Long and *short-run* work

A machinist of average skill requires only 30 minutes to set up the automatic cycle and tooling of a Sundstrand Lathe for an average job using 5 tools. No cams are employed—three standard trip dogs adjusted on the cycle control disc handle most work. Because of this simple set-up method, Sundstrand Automatic Lathes, properly tooled, will make possible important time savings on both long and *short-run work.*

Learn what a Sundstrand can do for you—get your copy of this *free* practical book that gives details of actual applications on all kinds of work. Write for Book 127.

Tooling and Operations



Commutator assembly is held in collet type chuck, pneumatically operated. Part is located by stop against copper. Three high-speed steel cutting tools are mounted in special holder.

Material—Copper laminations separated by mica segments.

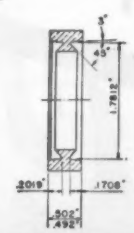
Operations—Bore portion of I. D., undercut adjoining portion, break and form corner, and face outer surface at one pass.

Feed—0.004 in.

Working Stroke—¼ in.

Cutting Tools—High-speed steel.

Drawing below shows operations performed at one pass on one side of commutator assembly. Part is then turned over for same operations on other side.



SUNDSTRAND MACHINE TOOL CO.

Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

2533 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.

KEEP YOUR DRILLS IN "new tool" CONDITION WITH THE OLIVER DRILLPOINTER!

Poorly sharpened drills, drills with points off center, with incorrect clearances or unequal point angles will hold up your production! The OLIVER NO. 510 DRILL-POINTER will keep your drills in topnotch condition for long runs of accurate work. Even unskilled operators can grind points that are mathematically accurate in every dimension, points that cut clean and accurately, reducing load on both machine and tool. Oliver-ground drills require less feeding pressure and horse-power to operate, they last longer between grinds, they reduce drill breakage and produce less scrap.

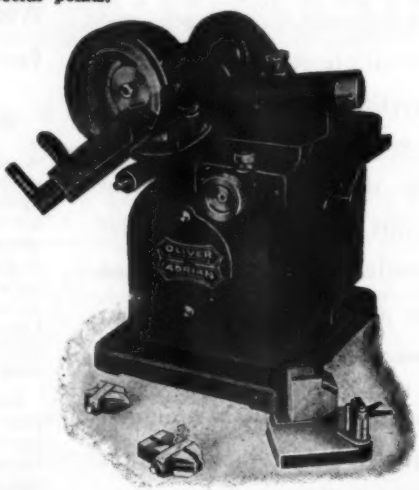
(Write for details.)

OLIVER INSTRUMENT CO.

1410 E. MAUMEE ST.
ADRIAN, MICHIGAN

OLIVER NO. 510 DRILLPOINTER (above). Automatic operation produces patented Oliver variable point angles and variable clearances. Quickly set up for drills from ¼" to 3" dia., for any point angle from 82° to 160°.

OLIVER NO. 21 BENCH DRILL GRINDER (below). Hand operated for drills from No. 57 to ½". Attachments available for grinding oil hole drills and special points.



Don't Neglect Your Toolroom It's the Backbone of Production!

Oliver OF ADRIAN

AUTOMATIC DRILL GRINDERS — TOOL AND CUTTER GRINDERS — DRILL POINT THINNERS — TEMPLATE TOOL GRINDERS — FACE MILL GRINDERS — DIEMAKING MACHINES

FAST CUTTING SPEEDS AND HIGH PRECISION *centered in the* HENDEY

High Speed

12-INCH MOTOR DRIVEN CRANK SHAPER

This small Hendey Shaper is remarkably versatile in the classes of work it can handle and is a time saver on both light and heavy duty service.

A maximum cutting speed of 182 feet per minute on 6-inch stroke, meets requirements for high speed backed by power and accuracy. A minimum speed of 23 feet on 12-inch stroke and 4.5 feet per minute on 2-inch stroke provides ample power for heavier work at slower speeds.

CONSTRUCTION DETAILS

Crank gears running in massive Timken bearings
Heavy duty crank pin and block
Double walled cross rail
Three bearing saddle
Power down feed
Automatic lubrication
Universal table with tilting top

1874 — 70 years devoted to constantly improving the manufacture of machine tools — 1944

THE HENDEY MACHINE COMPANY, TORRINGTON, CONN.

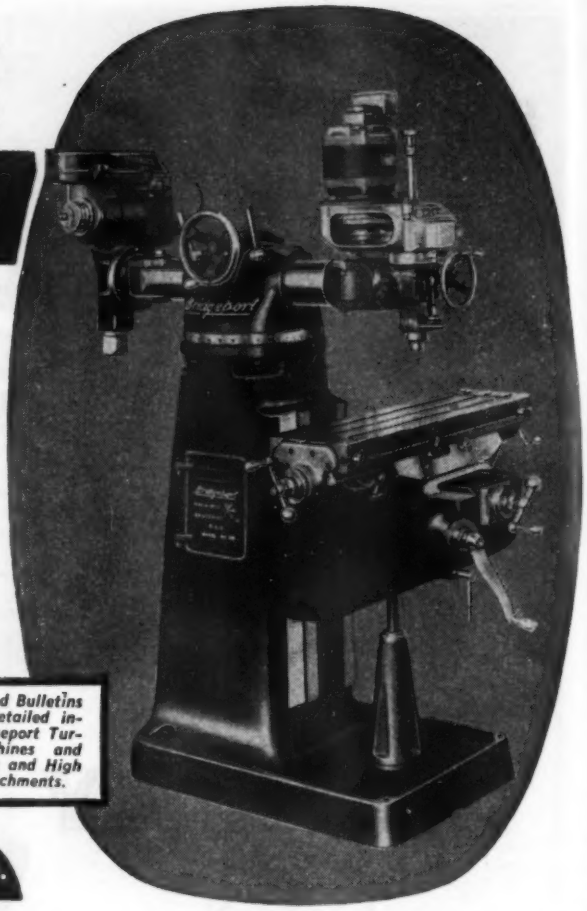
BOSTON NEW YORK ROCHESTER DETROIT CHICAGO

SHAPING *in addition to* MILLING, DRILLING *and* BORING . . . *now available on*

Bridgeport

TURRET MILLING MACHINES

The new Bridgeport Shaping Attachment adds an extra feature which makes these machines capable of almost unlimited utility. Design is such that this new attachment can be mounted not only on existing Bridgeport Turret Milling Machines (shown here on back end of overarm) but also on other types of milling machines and special production equipment. Shaping operations can be performed at all angles making this attachment fast, and practical on die and mold work of all kinds as well as for intricate slotting on production jobs. The Bridgeport Shaping Attachment is now in production and is available promptly.



Investigate This Versatile Machine

The Bridgeport Turret Milling Machine with High Speed Milling Attachment handles milling, drilling and boring at all angles with maximum ease and convenience. It can be depended on for accuracy and speed on a wide range of work. It is sturdy and powerful—a precision machine for production demands.

Features of the machine include: 15" diameter turret with 5" overarm, rugged construction, table, knee and saddle in convenient front-of-machine position, anti-friction bearings throughout, keyed overarm with worm wheel control for angular settings, large diameter graduated dials.

Bridgeport High Speed Milling Attachments are available as separate units (¼ HP and ½ HP) for use on other types of milling machines and production equipment. They are extensively used in all branches of the metal working industry and making a valuable contribution to war production.

Write for Illustrated Bulletins giving complete detailed information on Bridgeport Turret Milling Machines and Bridgeport Shaping and High Speed Milling Attachments.

THE BRIDGEPORT MACHINES, INC., *Bridgeport, Conn.*

Save Time . . . Cut Costs

THE PORTER-McLEOD IS THE MACHINE FOR URGENT NEEDS IN HIGH PRODUCTION CUTTING

The 8" Porter-McLeod Cold Metal Sawing Machine provides a high speed, high production means of cutting stock from 3" up. Its capacity is 8" round and 7½" square stock. Provision is also made for the nesting of bars or shapes so that multiple units can be cut at one time.

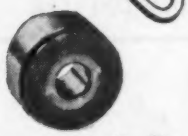
Production can be stepped up tremendously by this machine because of unique features of design. For example, the blade is supported close to its rim and pulled through the cut. Buckling of saw is thus prevented and accuracy maintained. This method of support and drive assures longer blade life, straighter, cleaner cuts, faster cutting and less power. Blades are designed so that every tooth cuts, a further contribution to speed.

Send at once for Description Bulletin, giving full and complete details on this machine which meets every requirement for solving today's high production problems in cold metal sawing.

PORTER-McLEOD MACHINE TOOL CO., INC.

HATFIELD, MASS., U. S. A.

Typical Jobs



Drawing and Blanking Die "Saves time in producing smooth base metal finish."

Compressor Yoke. Alignment maintained and better finish produced.

Mild Steel Clevis. Honing corrected errors of previous operations and maintained true alignment of two holes.

Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

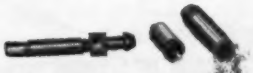
Aluminum Aircraft Link produces high finish without bell-mouthing.

Bearing. A very small part. 2 micro-inch finish necessary.

Shell Loading Die.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.



Airplane Engine Parts accurately honed to a super-smooth finish.

Idle Valve Guide. Honing after grinding holds a .0002" limit necessary for accurate idling.

Roller Bearing Outer Race. Finish improved from 12 micro-inches to 2 micro-inches.

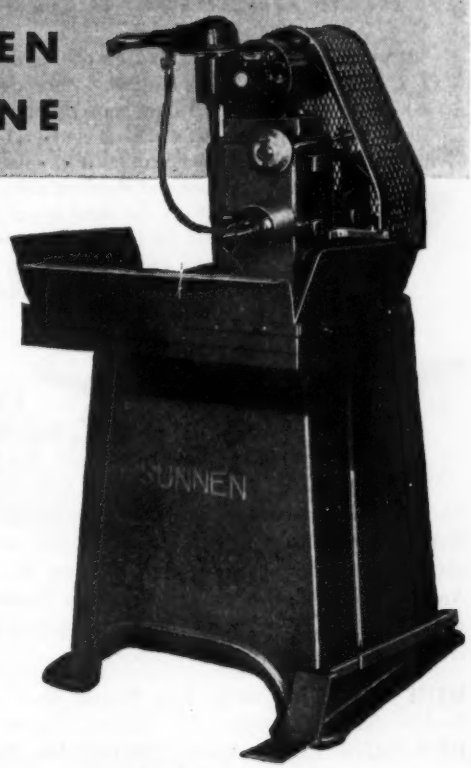
Cast Iron Valve Stem Guide. ½ to one thousandth removed—220 pieces per hour. Better finish and straighter hole.

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish. is secured.

PARTS LAST LONGER

When Honed on the SUNNEN PRECISION HONING MACHINE



Time after time, users of the Sunnen Precision Honing Machine have shown that they get longer service and have fewer repairs than by any previous method of internal finishing.

There's a good reason for these results, too. This machine has an amazing record for accuracy. Straight, round holes are produced with a guaranteed accuracy of .0001". Accuracy has been held to .000025" on hardened steel jobs. A super-smooth finish of from 2 to 3 micro-inches provides a better working surface.

A new base and pump assembly, recently introduced, has improved results still further. The pumping unit provides a constant flow of honing fluid that acts as a coolant, carries away cuttings, and keeps the abrasive stone in sharp cutting condition.

There are many other reasons why the low-cost Sunnen Precision Honing Machine will give you a finish that makes parts last longer. Get complete information by calling a Sunnen engineer to your plant—or write for free bulletin.

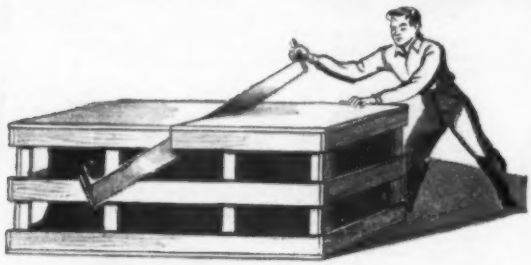
The coveted Army-Navy "E" waves over the Sunnen plant, evidence of the important part Sunnen equipment is playing in the war effort.

SUNNEN

SUNNEN PRODUCTS COMPANY • 7941 Manchester Avenue • St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

For faster handling by AIR EXPRESS



divide bulky shipments

into smaller units

THE handling, loading, and unloading of AIR EXPRESS shipments is a speedy operation. Crews are well-trained and skillful. They know and appreciate the importance of making connections, quick delivery. That is why a big bulky shipment that *could* have been broken into smaller units is a disservice to shipper and receiver alike. It simply cannot be handled with the same speed given to ordinary shipments. So to expedite your own shipments be sure they're made up in easily-handled units whenever possible.

A Money-Saving, High-Speed Wartime Tool for Every Business

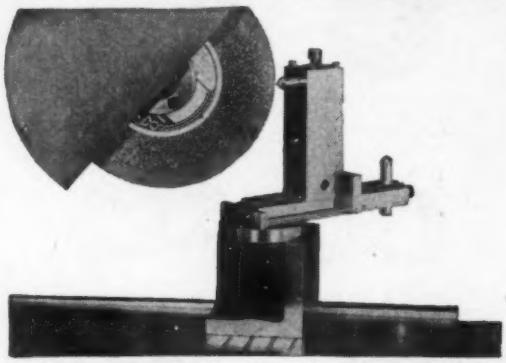
As a result of increased efficiency developed to meet wartime demands, rates have been reduced. Shippers nationwide are now saving an average of more than 10% on Air Express charges. And Air Express schedules are based on "hours", not days and weeks—with 3-mile-a-minute service direct to hundreds of U.S. cities and scores of foreign countries.

WRITE TODAY for "North, East, South, West"—an informative booklet that will stimulate the thinking of every executive. Dept. PR-9, Railway Express Agency, 230 Park Ave., New York 17, N. Y., or ask for it at any local office.

AIR EXPRESS
Gets there FIRST

Phone RAILWAY EXPRESS AGENCY, AIR EXPRESS DIVISION
Representing the AIRLINES of the United States

The "FORM-MASTER"
ANGLE & RADIUS DRESSER



An all-purpose angle and radius dresser for high-precision at low cost. Accurate easily within .001". Simple to operate. Dresses in vertical position enabling operator to SEE the form in work. All parts hardened and ground (except cast-iron base which can be drilled and tapped). Suitable for surface and cylindrical grinders. Two 1/3 ct. diamonds and instrument case included. $150.00.

It readily produces: Any desired angle
Convex radii to 4" on 7" wheel
Concave radii to 7" on 7" wheel

Specifications: Base 3" x 3", height 8½"
Wheel capacity 10"
Angular travel 3"

For information or a demonstration CALL YOUR SUPPLIER

Manufactured by
J. & S. TOOL CO.
477 Main Street East Orange 1, N. J.
"PRECISION DRESSING TOOLS"

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

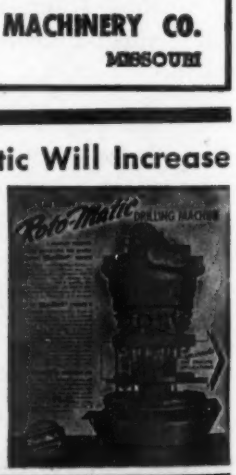
KNIGHT — VERSATILE · ACCURATE · RIGID · MILLERS

FOR FURTHER DETAILS SEE FULL PAGE AD IN PREVIOUS ISSUE

W. B. KNIGHT MACHINERY CO.
ST. LOUIS MISSOURI

Why the Vertical Roto-Matic Will Increase Your Drilling Production

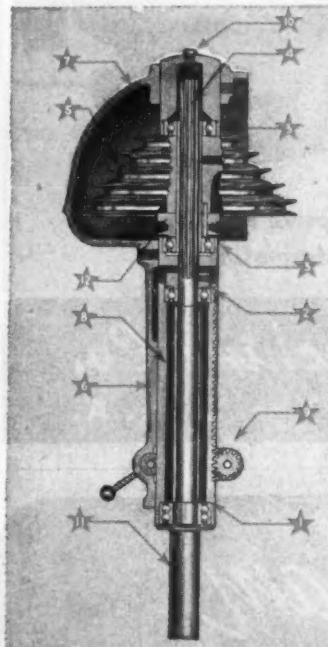
...is explained in this **FREE BOOKLET**



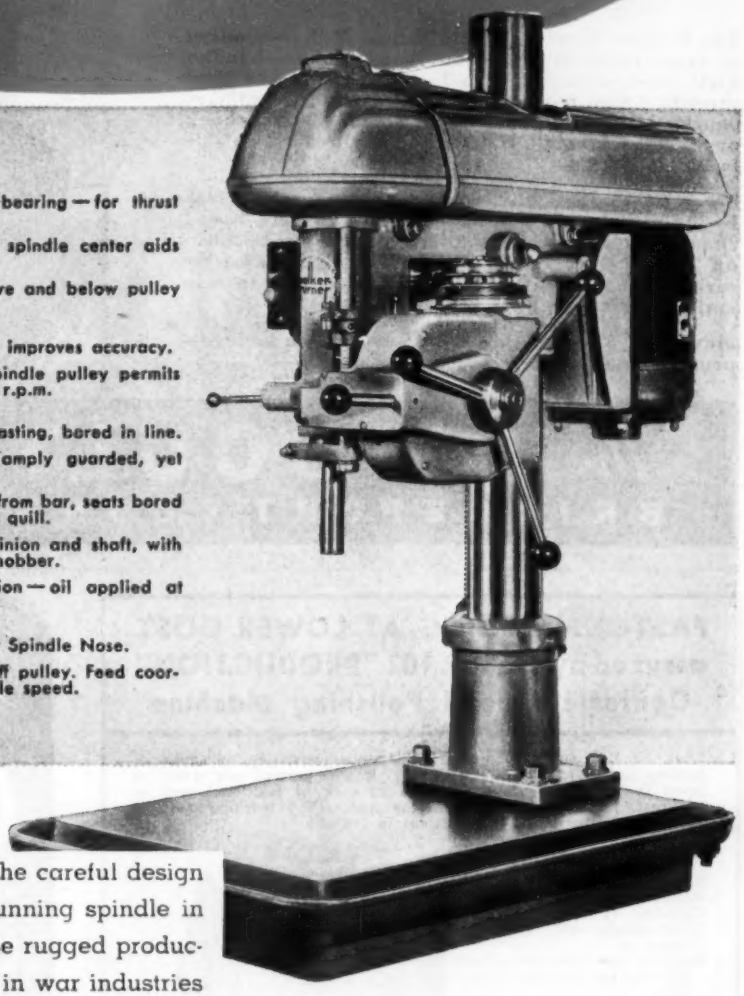
The ROTO-MATIC principle of continuous operations will enable you to drill, ream, bore, face, mill, etc., more parts in less time. Write for this booklet today; learn the many advantages of the ROTO-MATIC and how it can be specifically applied to your work. Ask for Bulletin No. C-100.

Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. · Milwaukee 14, Wisconsin

Why Industry Prefers THE WALKER-TURNER 20" DRILL PRESS!



1 Double row ball bearing — for thrust and radial load.
2 Ball bearing near spindle center aids rigidity.
3 Ball bearings above and below pulley eliminates whip.
4 Ten spline spindle improves accuracy.
5 Aluminum alloy spindle pulley permits speeds above 5000 r.p.m.
6 One piece head casting, bored in line.
7 Pulleys and belt amply guarded, yet easily available.
8 Steel quill turned from bar, seats bored and rack milled in quill.
9 One piece feed pinion and shaft, with teeth cut on gear hobber.
10 One-shot lubrication — oil applied at one point only.
11 No. 2 Morse Taper Spindle Nose.
12 Power feed take-off pulley. Feed coordinated with spindle speed.



The sectional view above illustrates the careful design that provides an unusually smooth-running spindle in Walker-Turner 20" Drill Presses. These rugged production machine tools are in use in great numbers in war industries today. Due to their versatility, many have been applied in special tooling set-ups of various kinds. Simplicity of controls permits their use by unskilled and semi-skilled labor — an important point under present conditions as well as in the post-war period.

Send for descriptive literature

WALKER-TURNER CO., INC., 4524 Berckman Street, PLAINFIELD, N. J.

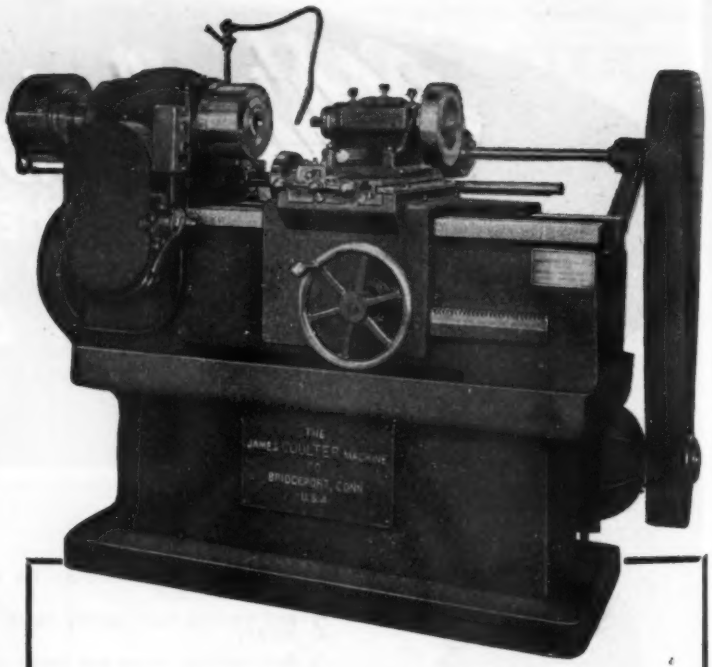
Furnished in bench, floor and multi-spindle models — with or without power feed. Capacity ¾" in steel, 1" in cast iron. Spindle speeds 260 to 2600 r.p.m.

walker-turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL
THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

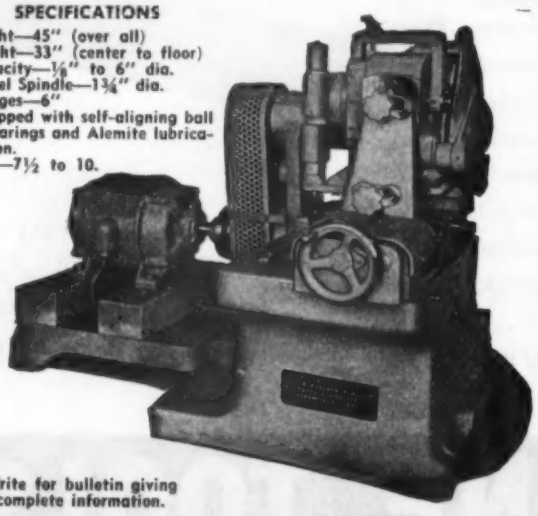
The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

FASTER FINISHING AT LOWER COST assured by the No. 101 "PRODUCTION" Centerless Feed Polishing Machine

Work handled on this machine requires no centering, chucking or holding and is just fed automatically. It will produce any grade of finish in polishing or buffing cylindrical work at fast feeds and at low cost. Inexperienced operators can handle this machine and get more and better work at bi- savings in time.

SPECIFICATIONS

Height—45" (over all)
Height—33" (center to floor)
Capacity—⅛" to 6" dia.
Wheel Spindle—1¾" dia.
Flanges—6"
Equipped with self-aligning ball bearings and Alemite lubrication.
H.P.—7½ to 10.



Write for bulletin giving complete information.

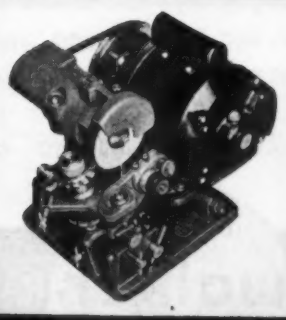
PRODUCTION MACHINE CO.
Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.

Waltham CUTTER SHARPENER

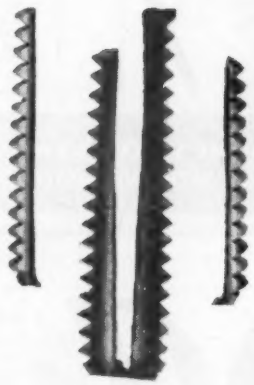
For fast, economical, accurate sharpening of cutters for gear cutting and thread milling, circular form tools, straight fluted hobs, and multiple cutters not over 2" in diameter and 3/8" thick. Standard machine uses index plates. Pawl attachment for locating on top or back of teeth available as extra.

Send for Bulletin No. 344 which gives complete construction and operating details.

ECONOMICAL
FAST, ACCURATE
EASILY OPERATED



EDWARD BLAKE COMPANY
634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.
BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS



By the ELOX METHOD

The Elox method of removing a broken tool from a part being machined might very aptly be called "Disintegrator Drilling". It makes no difference how hard the broken tool may be. A core is drilled down through it by the Elox electrical disintegrator and the core removed. Then the remaining strips of thread of a tap or the cutting flutes of a drill or reamer are easily collapsed and picked out of the hole.

This method does not in any way damage the metal of the work part or the work already done on it. The temperature of the metal of the work part is not raised sufficiently to cause any metallurgical change.

The Elox method is also used to drill holes of various shapes in hardened dies and machine elements without annealing.

Write for descriptive folder and specifications.

Type "H" Disintegrator

CORPORATION
ELOX

3-252 GENERAL MOTORS BLDG. • DETROIT 2, MICHIGAN

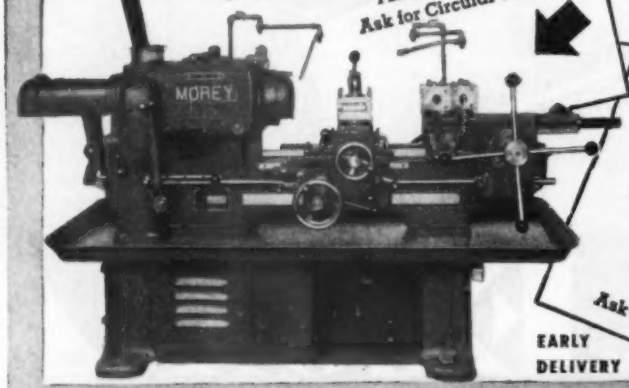
Plant—18273 LIVERNOIS AVENUE, DETROIT 21, MICHIGAN

MOREY TURRET LATHES

for BAR or CHUCKING { UNIVERSAL or PLAIN

#3 UNIVERSAL

For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A



#2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

#4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

EARLY DELIVERY

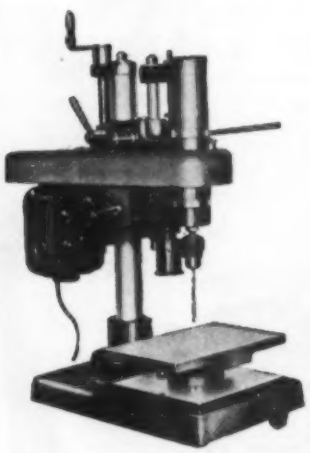
- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS *MODERN* TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

MAXI-JR-E



Super Sensitive Drilling Machine

• Designed and built for accurately drilling small holes .004" to .250" diameter. It consists of a self-contained drilling unit which swings radially on the column and may be locked in any desired position.

Here's an exceptionally flexible small drilling machine which is easy to operate and may be ganged for sequence operations or to obtain greater production.

• Another distinct advantage is the full floating spindle of special design which eliminates radial belt pull on the spindle.

Distance from center of chuck to column, 5 inches. Vertical work capacity from base to chuck, 18 inches. Spindle speeds from 750 to 12,000 R.P.M. Write for full descriptive bulletin.

for
- BETTER SEEING
- BETTER FEELING
- BETTER DRILLING

The Hamilton Tool Co.

830 NINTH ST. HAMILTON OHIO

Sensitive DRILLING MACHINES
Avey
CINCINNATI OHIO

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke
THE SMITH & MILLS CO. Cincinnati, Ohio

MILLHOLLAND

Automatic DRILLING - BORING MILLING - TAPPING Units

½ to 20 HORSEPOWER DRIVE

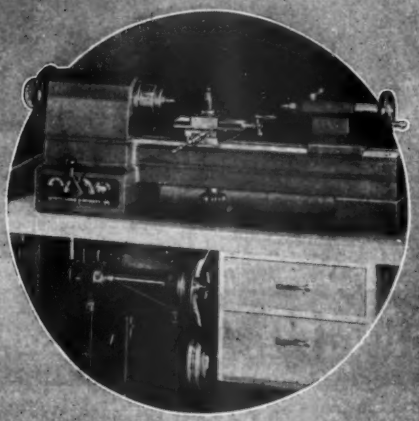
AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

RIVETT

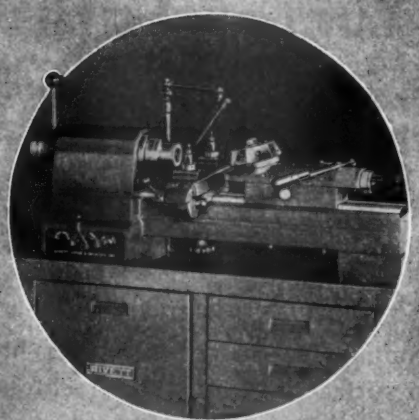
TOOL-ROOM LATHES

RIVETT 608 back-geared, screw cutting lathe is recognized the world over for its ability to produce fine work within guaranteed precision limits. In manufacturing, tool-making and experimental work, it will handle a great variety of parts in minimum time. Finely made attachments for milling, spiral cutting, slotting, relieving, taper turning, ball turning, grinding, forming and multiple operations are available. Swing is 8½" dia.; center distance is 18¼"; collet capacity is 1" max.



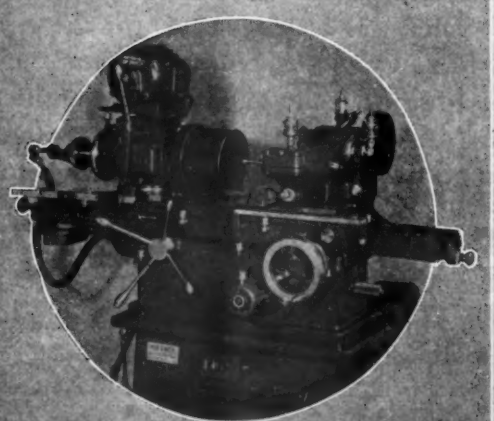
PLAIN BENCH LATHES

RIVETT plain precision bench lathes have vastly increased the earning power of such machines. An engineered unit, a Rivett lathe is quick to set-up, has wide speed range, power and vibrationless performance and is capable of many jobs often produced on heavy, costly machines. Two sizes are furnished: Series 715 has 7" dia. swing, 15" center distance and ¾" max. collet capacity; Series 918 has 9" dia. swing, 18" center distance and 1" max. collet capacity.



HAND SCREW MACHINES

RIVETT 918 hand screw machine incorporates precision, balanced design and operating features to make it an efficient producer on small duplicate parts. Bar stock passed through spindle may be held in push-out collet, while work individually chucked may be held in draw-in collet, step chuck or jaw chuck. In combination with six turret operations, double tool cross slide can be furnished for straight or taper turning, forming or cutting-off. Swing is 9" dia. and collet capacity is 1" max.



INTERNAL GRINDERS

RIVETT internal grinders are primarily designed for tool room work, however, are used extensively in precision manufacturing. Available internal and external spindles in combination with many adjustments make possible a great variety of grinding operations. Two sizes are furnished: Series 104 has internal and external grinding capacity up to 3" dia. with power table travel up to 4"; Series 112 has internal and external grinding capacity up to 8" dia. with power table travel up to 8".

Write for General Bulletin 500

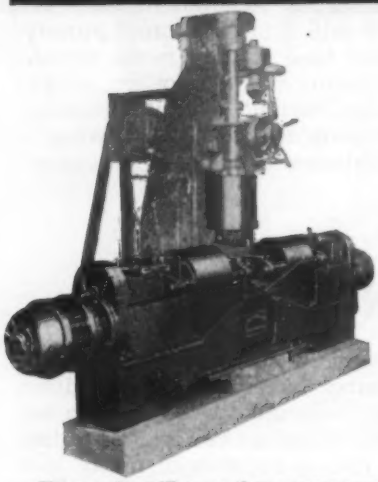
ARMY E NAVY

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS., U.S.A.

ADAPTABILITY.. HOEFER MULTIPLE SPINDLE HEADS

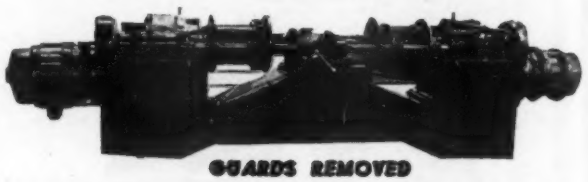
OFFER MANY PRODUCTION COMBINATIONS FOR INCREASING OUTPUT



EXAMPLE: Showing the possibilities of making a three-way high production machine using two units mounted on a base in connection with a standard heavy duty driller. The central electrical control and the regular power feed lever on the driller automatically start the feed of both units, which go through their required cycle and stop at return position. This unit drills 26 holes in three different planes in the time previously taken to drill the longest hole of the 26.

These units will more than repay your investment in the quality of work produced and in uninterrupted service. No matter what your job is we can furnish the head to meet your production need. Let one of our experienced engineers confer with you.

SHOWS HEADGUARDS IN PLACE

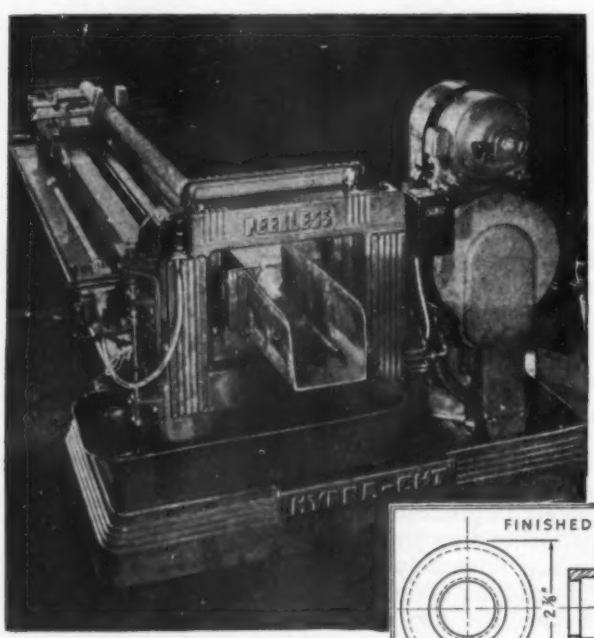


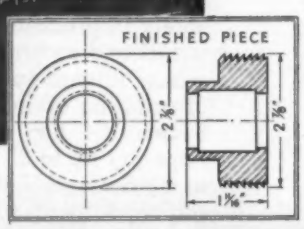
GUARDS REMOVED

EXAMPLE 2: Two way machine consisting of 3 and 5 h. p. units driving 8 and 12 spindle universally adjustable heads. The fixture is mounted on center of machine for drilling both ends of compressor simultaneously. Machine has central electrical and central hydraulic control.

Hoefer's Whole Business is Holes . . . . **HOEFER MFG. CO.** *Freeport, Ill.*

Take the Load Off Your Turret Lathes!





By doing the cut-off operation on a precision, Peerless Automatic Saw more finished parts were produced in the Lathe Dept., at less cost.

Peerless Precision Sawing Saves Time, Machines and Men . . .

TO break a "bottle neck," this part made from 3" round x 1335 hot rolled stock, was cut off at the rate of 7 sq. in. per min. in a 7" x 7" Peerless Hydra-Cut Saw.

Smooth, straight-line metal sawing at high speed, with no surface hardening or fracture, is standard performance with Peerless Metal Sawing Machines. Taking as little as 1/16" for the cut, Peerless gives you more usable pieces from each piece of stock. Tell us about your toughest metal sawing operation. Fit Peerless into your postwar plans. Let's see if we can help.

PEERLESS MACHINE CO., Dept. AM-844, Racine, Wis.

- ☐ Mail catalog on Hydra-Cut Saw for High Production Cutting
- ☐ Mail catalog covering Vertical Type used for Die Block Work
- ☐ Mail catalog on Mechanical Type Saw for production cutting
- ☐ Mail catalog on general utility and maintenance Saws

Company_____

Individual_____

Street_____

City_____ State_____

PEERLESS MACHINE COMPANY

He Never Has to Take His Eyes Off the Cutter and Work

DEVLIEG JIGMIL

Spindle start, stop and reverse—

Power vertical feed and rapid traverse movement—

Power horizontal feed and rapid traverse movement—

Power automatic table retraction and repositioning—

Power feed and rapid traverse to bar movement—

are all carried in a master switch on the spindle head — at the operator's finger tips.

Thus, the operator of the DeVlieg Jigmil can fix his vision on the cutter and work—never has to look at controls during operation.

The Jigmil is what a machine tool should be—a powerful and accurate extension of the operator's hand. The value in precision boring and milling is apparent.

It's a NEW Type Machine

Spacing Accuracy of a Jig Borer . . . Performance Qualities of a Milling Machine . . . Convenience and Flexibility of a Horizontal Boring Mill.

New speed of operation . . . New standards of excellence of bored holes . . . New accuracy in milling . . . Automatic table retraction and repositioning dependable within .0002".

Many machines show 75% greater average daily productivity.

ARMY E NAVY

Write for Circular

DEVLIEG MACHINE TOOLS

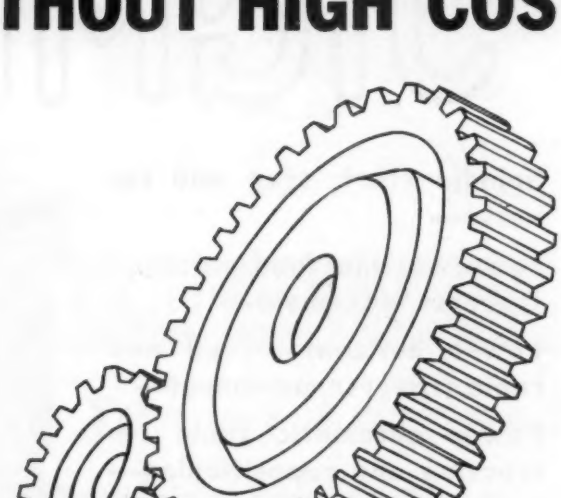
DE VLIEG MACHINE COMPANY

450 FAIR AVENUE, FERNDALE 20, (DETROIT), MICHIGAN

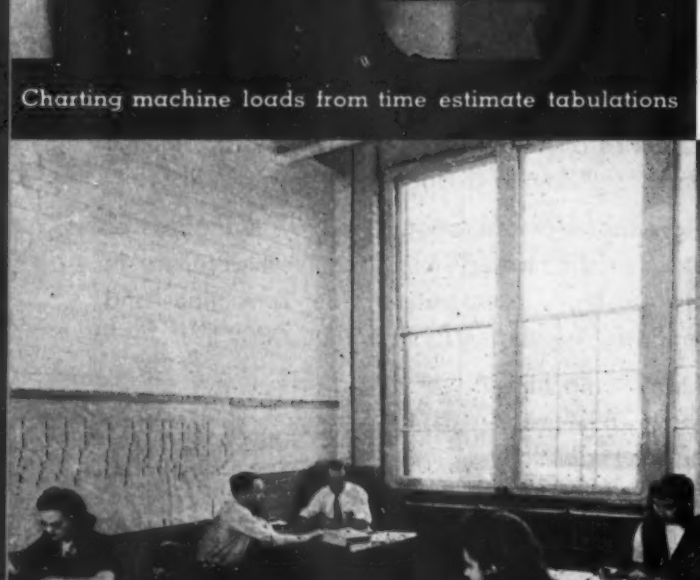
Orders received are posted on master charts located in General Manager's office

Production efficiency...

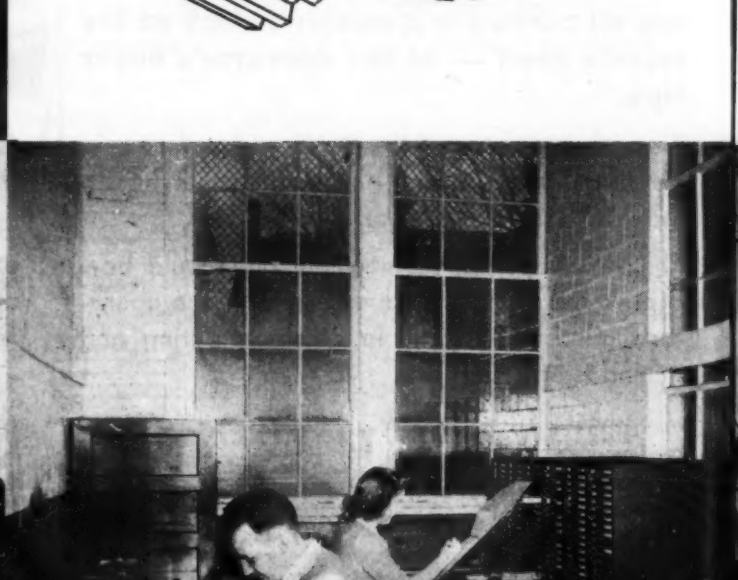
HIGH QUALITY WITHOUT HIGH COST



Charting machine loads from time estimate tabulations



The nerve center—routing and production planning



Kardex stock and purchasing control

A SOUND operating system is essential to production efficiency. Defiance is well organized. Orders receive prompt attention, machine loads are tabulated to avoid bottlenecks and all manufacturing operations are carefully planned, followed and checked. You can tell from the Production Supervisor's charts exactly where any part in process is at any time. Purchasing is also controlled to assure no tie-ups but also to avoid excessive inventories.

We are constantly analyzing machining methods for possible improvements. We make all our own patterns to assure the proper amount of stock on all castings.

Current figures are kept on all details of the business. Good controls need not be expensive. Our system is direct and effective but requires only a small staff. Each person has well defined responsibilities. Overhead is kept at a minimum. Defiance has production efficiency.

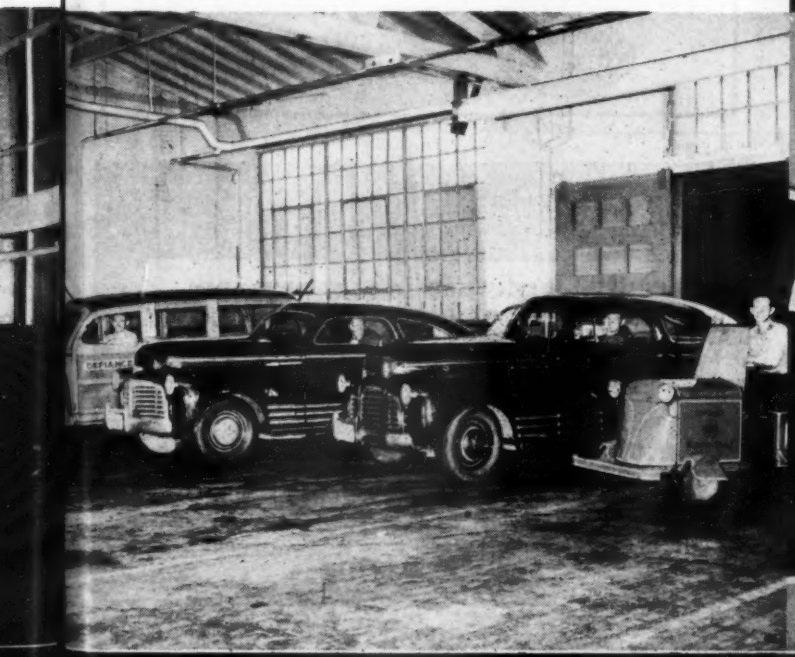
Defiance Machine Works, Inc.,
Defiance, Ohio.

DEFIANCE

HORIZONTAL BORING MILLS ... AND A COMPLETE LINE OF DRILLING EQUIPMENT

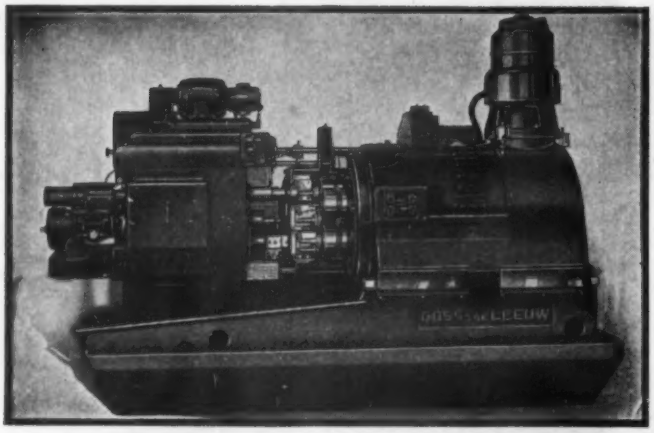
Tool Designing

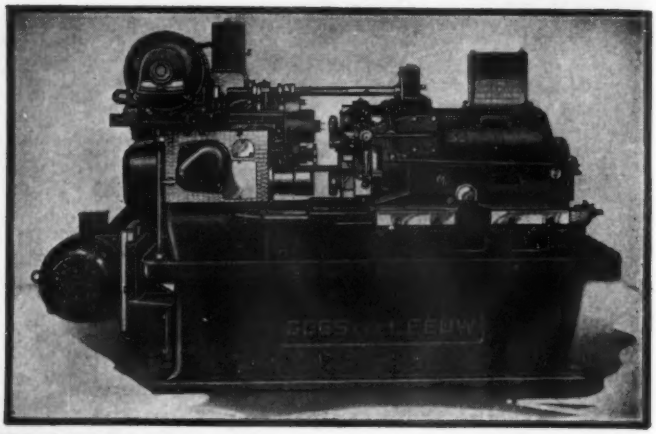
Patternmaking



efiance customers receive prompt service when needed

The Proof of Production Efficiency. National Machine Tool Builders Assn. Production Award and Army-Navy "E"





WORK ROTATING TYPE

- 5 Spindles
- 6 Spindles
- 8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

- 4 Spindles
- 5 Chucking Positions

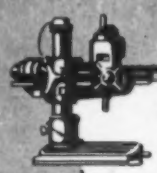
On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

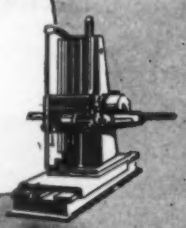
Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

GILBERT



PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES



DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.
CINCINNATI, OHIO

Giant KEYSEATERS

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

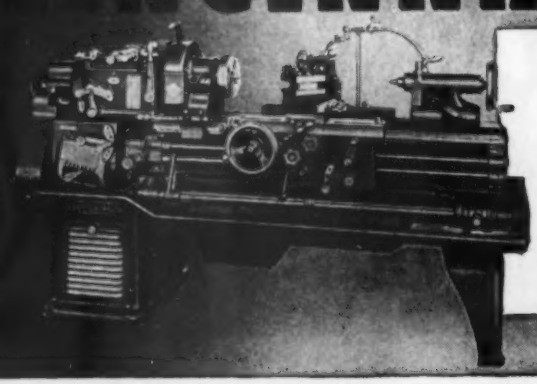
MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

LUCAS "PRECISION"
Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

CINCINNATI LATHES

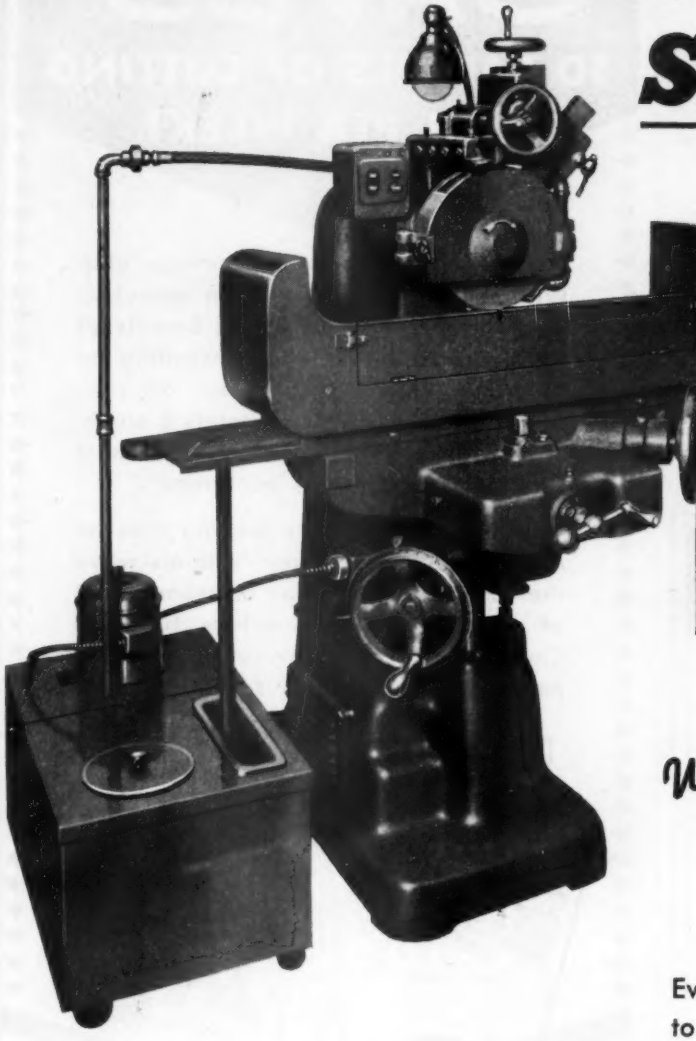


Inherently accurate on every job

In every detail of design and construction, accuracy of these modern, convenient lathes assures precision performance. For example: gears are cut to closest tolerance, hardened and ground; spindle is mounted on roller bearings taking thrust in both directions; ways and carriage are hand scraped to closest precision. A massive bed construction provides strength and stiffness which contribute to overall accuracy on heavy cuts. Sizes from 14" to 30". Supplied with proper equipment for machining different size Shells.

THE CINCINNATI LATHE & TOOL CO.
Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

Even "Green" Operators are *Setting Records*



With COVEL NO. 15 SURFACE GRINDER (6" x 18")

CHECK THESE FEATURES

- ★ *Ball bearing spindle — dust-protected.*
- ★ *3-speed V-belt drive.*
- ★ *V and flat table ways.*
- ★ *Convenient controls.*
- ★ *Extra-large work table.*
- ★ *Ample knee-room for operator's comfort.*
- ★ *Built-in wheel truing device (optional).*
- ★ *Wet Grinding Attachment (optional).*

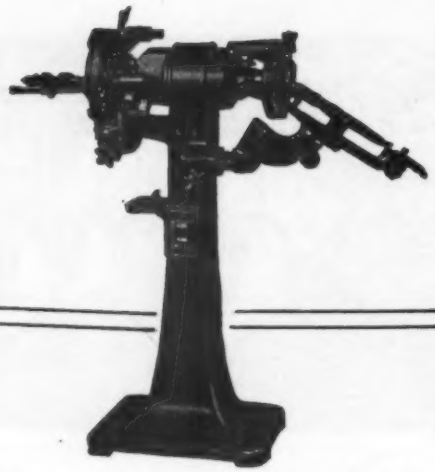
Ever since war industry's boom made it necessary to use almost any help available, hundreds of "green" operators (many of them women) have been setting enviable records with Covel No. 15 Hand Feed Surface Grinders. That's because this fast, precision machine is designed and built for easy, efficient work — and operators quickly acquire the "know-how." Equally important, work spoilage is cut to a minimum, for grinding wheel can't fall into the work. Spindle remains stationary, and work moves UP to the wheel. Its "quick set-up" feature also makes the No. 15 ideal for either production line or tool room. Write today for Bulletin A-184.

GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

Grand Rapids



COMBINATION DRILL AND TAP GRINDERS

Model 10-B

Sharpens Taps, 2, 3 and 4 Flute, Right or Left Hand. Sizes No. 6 to one and one half inches.

Sharpens Drills, 2 and 3 Flute, Straight or Taper Shank. Sizes from one eighth to one and one half inches.

"Sharp Drills and Taps
Cut Holes in Rising
Production Costs."

Other Combinations Also Available

•

Write for complete descriptive literature

GALLMEYER & LIVINGSTON CO.
300 Straight Ave. S.W.
GRAND RAPIDS MICH.

SAVES
10 BARRELS OF CUTTING OIL PER WEEK!

"Before we bought our American Chip Wringer", writes a Michigan manufacturer*, "we were using 12 barrels of cutting oil a week. After installing an American Chip Wringer, our oil consumption dropped to 2 *barrels a week*. We consider our chip wringer the most profitable machine in our plant".

In less than 3 minutes running **time an American Chip Wringer reclaims more than 90% of the cutting oil from a load of metal chips and machine turnings. Can be operated by any unskilled person, too. Write for full particulars.**

*Name furnished on request

★ American Chip Wringers are available in following models: 220, 226, 230, 240, 248. ★

SEND FOR ILLUSTRATED

The AMERICAN LAUNDRY MACHINERY COMPANY
CINCINNATI 12, OHIO

The next eye accident in your plant

may cost many times the price of the Goggles that can prevent it

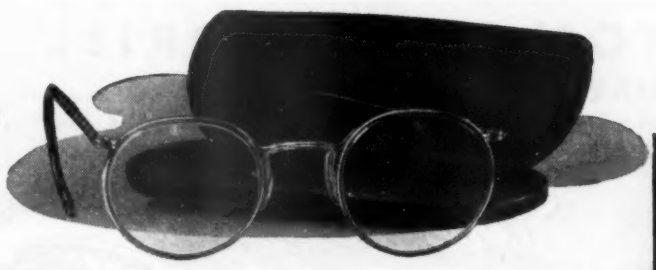


Figure it out for yourself—

The National Safety Council estimates that the average eye accident cost per injured man is $328.00—and this includes only the actual dollars and cents which can be set down in black and white.

The "hidden" costs generally run *four times* this amount for spoilage, idle machinery and lost production.

And when you consider that for about 75¢ per eye, AO Safety Goggles will protect a worker's vision . . . help him turn out more work . . . it becomes evident that furnishing AO Goggles for workers is an effective way to cut costs as well as provide protection.

American Optical
COMPANY
SOUTHBRIDGE, MASSACHUSETTS

...CALL IN AN AO MAN AND KEEP YOUR "PRODUCTION EYES" PRODUCING

PORTAGE

NO. 4

HORIZONTAL BORING DRILLING & MILLING MACHINE

• Designed and built to meet the need for speed and accuracy demanded of today's production.

WRITE TODAY

for fully illustrated bulletin giving detailed description of the many features of this Horziontal Boring, Drilling and Milling Machine. No obligation.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

Variable Speed SPEED LATHES *for* PRECISE LAPPING OF GAGES •

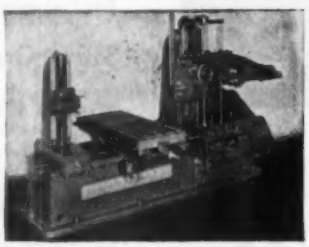
Ideal FOR FINAL FINISHING OPERATIONS

Speeds as low as 20 r.p.m., for accurate lapping of gages, and as high as 4,000 r.p.m., (with ample power for rotating heavy work), for de-burring, polishing, filing, etc., are available in these foot-operated speed lathes. Speeds are infinitely variable. Write for Catalog 440.

SCHAUER MACHINE COMPANY
ORIGINATORS OF TODAY'S SPEED LATHES
2067 READING ROAD . . . CINCINNATI 2, OHIO

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

HOLMAN BETTER, FASTER HOLE FINISHING

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

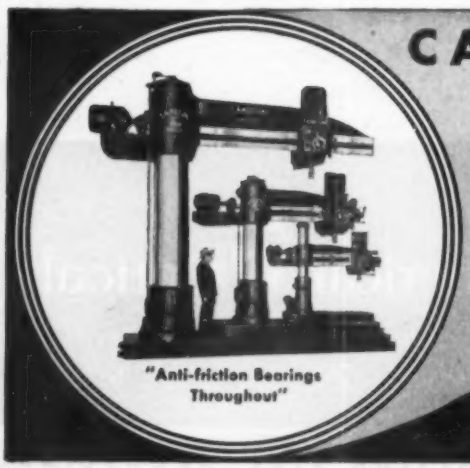
HOLMAN REAMER CO.
MANCHESTER, CONN.

ROCKFORD MACHINE TOOL CO.

Hy-Draulic

Shapers . . Planers . . Slotters . . Shaper-Planers
ROCKFORD, ILLINOIS, U. S. A.

CARLTON RADIAL DRILL



"Anti-friction Bearings Throughout"

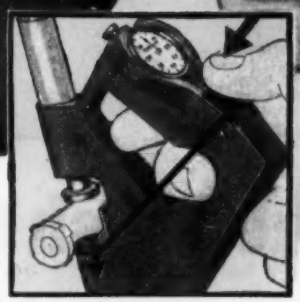
FEATURES—1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The **CARLTON**
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

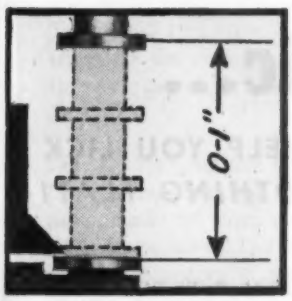
ARMY E NAVY

Why Not SEE Rather than feel

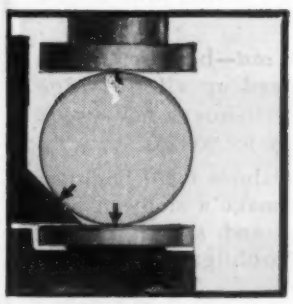
Weight of Gage and operator's hand rests upon the fixed contact. Gage is only 5/8" wide.



A light thumb pressure retracts the sensitive contact. Work surface is not marred. The contact movement is transferred *direct* to Indicator.



The upper or reference contact is adjustable to any dimension within one inch.



Backstop locates work in center of contacts and is adjustable for size.

FEDERAL
INDICATOR SNAP GAGE
with-Retractable Anvil
Adjustable for Size
No Lost Motion

This Model 1330 P-100 Visual Dial Indicator Snap Gage marks a decided step ahead in gaging practice. Conventional type, fixed or solid snap gages depend upon "feeling", and personal variations in the sense of touch influence the inspection accuracy. But, you **see** with this.

The Model 1330 P-100 has other advantages too — **The retractable anvil** makes it easier to apply, and it eliminates all excuses for marring the surface of highly finished workpieces. **It is easily adjusted** to any dimension within one inch and locked in place. **There is no lost motion.** The movement of the sensitive contact is transferred directly without error to the Dial Indicator. **The weight of the Gage and the inspector's hand rests upon the fixed or reference contact. It is thin:** only 5/8". It is small; not over 6" at the longest point. It is light; weighs only 15 ozs. It reads in tenths (.0001"). Contacts are hard wearing Norbide (Made by Norton Co.) For more details concerning this modern snap gage write

FEDERAL PRODUCTS CORPORATION
1144 EDDY STREET **PROVIDENCE 1, R. I.**

★ ★ ★ ★ ★ **FEDERAL** ★ ★ ★ ★ ★

PRECISION MEASURING INSTRUMENTS

The brush that plays sweet music...

THERE'S AN OSBORN BRUSH THAT CAN HELP YOU LICK *YOUR* SURFACE FINISHING JOBS IN *NOTHING FLAT!*

BAND instruments, plated with silver, gold or brass must be polished *inside* to a satin-smooth finish. Otherwise—sour notes, flat, music.

An Osborn Brass Wire Wheel Brush does this exacting job—and the bands play on as ships are launched whose welds were cleaned with Osborn brushes—as planes take off whose rivet bonding was done with Osborn End Brushes.

Surface finishing has a direct relation to how a product performs, as well as how it looks. Almost any product! Brushing wheels as developed by Osborn, 50-year pioneer and leader in the field, have been *proven* under wartime stress—the best tools for this type of work.

In developing your new products—whatever they are—it will pay you to consider the great versatility of Osborn brushes for surface finishing, making your product perform better, look better, sell better.

All at a lower unit cost—because Osborn brushing tools speed up all finishing operations, reduce man-hours, and insure maximum uniformity as well.

Write us and an Osborn Field Engineer will be detailed to make a study of your operation or plans and submit specific recommendations. No obligation, of course.

THE OSBORN MANUFACTURING COMPANY

5401 Hamilton Avenue *Cleveland, Ohio*

Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY

Geometric Class S, a universal Collapsing Tap for almost any machine and almost any internal threading job over 1¼" dia.

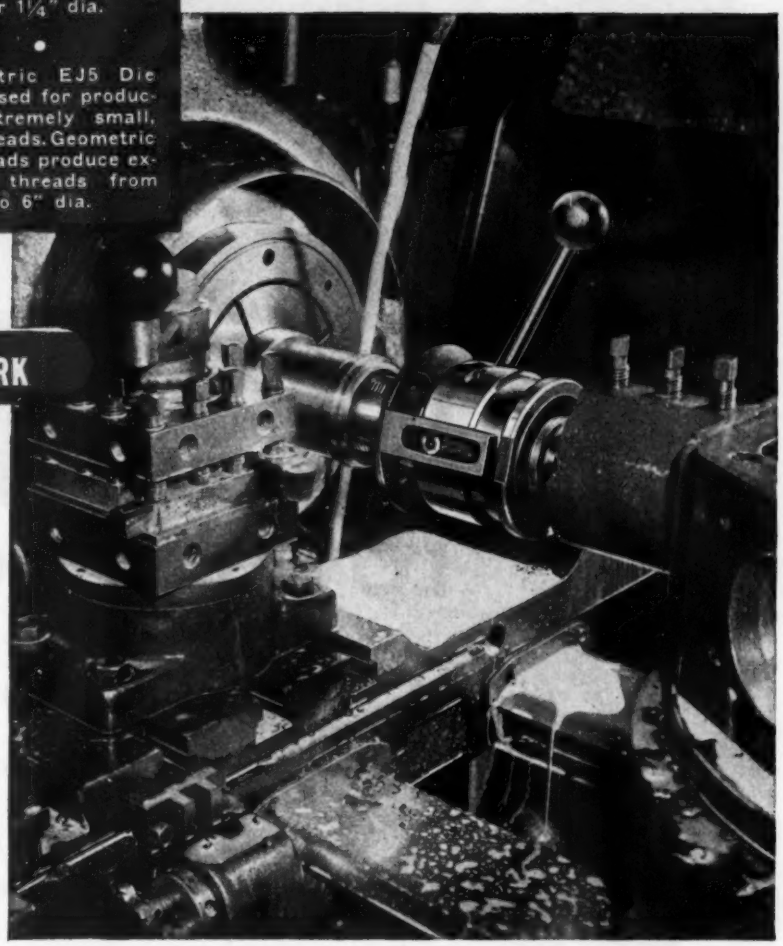
Geometric EJ5 Die Head used for producing extremely small, fine threads. Geometric Die Heads produce external threads from 1/16" to 6" dia.

Geometric Tools AT WORK

Typical of many other Geometric threading tools helping speed up today's aircraft production schedules is the Geometric Tap shown at work in a well known west coast aircraft plant. In upwards of 10,000 other shops the performance ability of Geometric Taps and Die Heads is being proved every working day, giving long runs of accurate threading on virtually every type of production.

All the tools of the complete Geometric line have these fine tool features: Every major part made of special alloy steel, hardened and tempered all the way through . . . Quick, easy, accurate chaser adjustment, rigid chaser support . . . Easy shoulder threading . . . All working parts fully protected.

Standardize on Geometrics for threads of uniform quality on all your war production jobs—and for profitable production in the peace-to-come!



Geometric Taps and Die Heads are correct for almost every internal threading job from 1" to 8½" dia.—for external threads from 1/16" to 6"—for coarse threads and threads as fine as 80 per inch. Write for data, outlining your requirements.

ARMY E NAVY

FOR SAVING PRECIOUS CHASERS

For top results on YOUR job, give us FULL data when ordering chasers. Tell us: Exact specifications of material to be threaded; whether a forging, stamping, etc.; tolerances called for; machine on which job is to be done; hardness of material; whether heat-treated, etc. Send detailed sketch of part if possible.

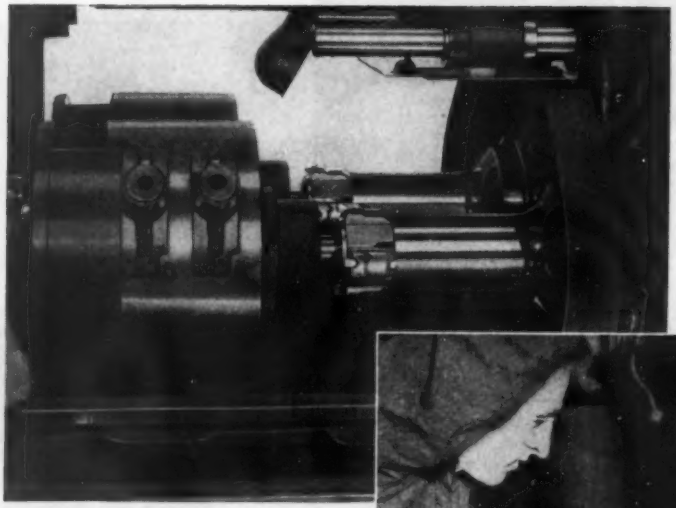
GEOMETRIC
TOOL COMPANY

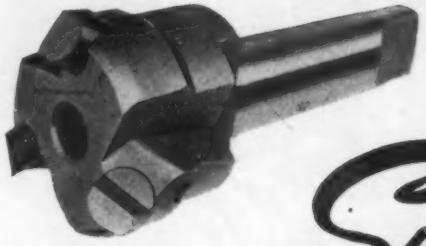
★

Machinery and Tools for cutting Screw Threads

★

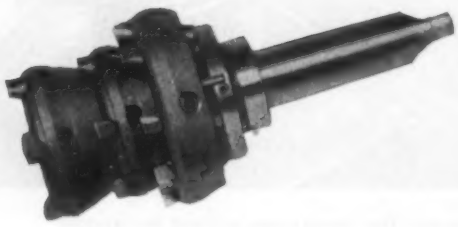
NEW HAVEN 15
CONNECTICUT





Special LOVEJOY BORING HEADS

USE MANY STANDARD PARTS THAT LOWER COSTS ALL DOWN THE LINE



Users of Lovejoy Boring Heads appreciate the Lovejoy designs which incorporate standard parts wherever possible. This attention to detail pays off all down the line—first cost is low—maintenance costs are low—there is no need to carry expensive stocks of special parts—standard parts are available out of Lovejoy's stock the day the order is received.

All Lovejoy Boring Heads use famous Lovejoy positive-locking blades. These guarantee free cutting qualities and remove stock under coarse feeds with a minimum of power consumption—they cannot loosen even under intermittent cuts in deep holes.

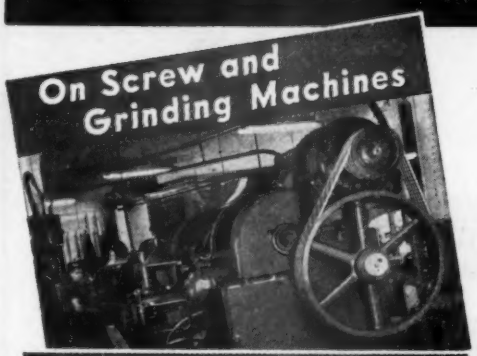
When two or more heads are mounted on the same bar for roughing and finishing, or for multiple diameter cuts, the Lovejoy split tapered bushing mount is a time and labor saver. Complete details will be sent on request.

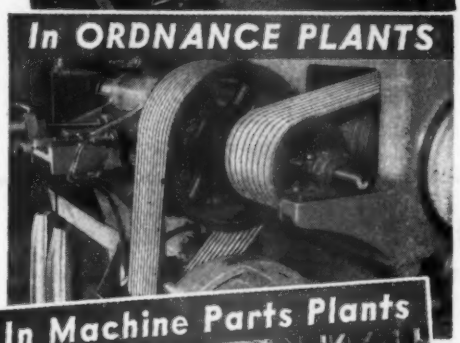
Lovejoy TOOL COMPANY, Inc., SPRINGFIELD, VT., U.S.A.

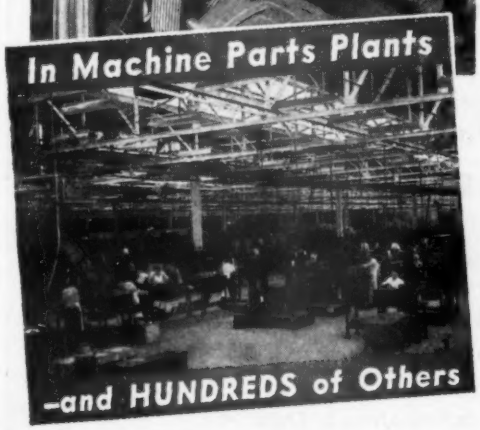
MILLING CUTTERS | BORING HEADS | ARBORS | SPOT FACING TOOLS | COUNTERBORES | BORING BARS | SINGLE POINT TOOLS | TURRET TOOL POSTS

For MORE *than* 6 YEARS . . .

GATES *Synthetic Rubber* V-Belts







449

—Have Been *OUTWEARING* Any *NATURAL RUBBER* Belts Ever Used!

More than 6 years ago Gates began supplying American Industry with thousands upon thousands of V-Belts made *entirely* of synthetic rubber.

This was long before synthetic rubber came to be used merely as a *substitute* for natural rubber—in fact, Gates chose a very *special* synthetic rubber for the one reason that it is, in many important respects, *greatly superior* to natural rubber.

*** There are, of course, many kinds of synthetic rubber. Gates uses each kind where it best meets some particular service need.**

For example:—one special synthetic rubber which Gates uses extensively in making V-Belts has the ability to withstand oil and heat much better than natural rubber can. Where oil and heat conditions are especially severe, Gates special synthetic V-Belts are giving 3 times to 4 times the service life of any natural rubber V-Belts ever used.

This is the record not of a few belts over a limited period but of thousands upon thousands of Gates synthetic rubber V-Belts installed in hundreds of plants and factories during the past 6 years.

Today, as you know, all industry depends on belts made of synthetic rubber—and that is exactly why Gates' long head-start in fabricating belts of synthetic rubber is so *important* to you *NOW!*

By simply picking up your phone and calling the Gates Rubber Engineer, you can now have, in your own plant, the full benefits of Gates' greater knowledge and experience—a distinct advantage to you in *longer belt life* and in *trouble-free operation*.

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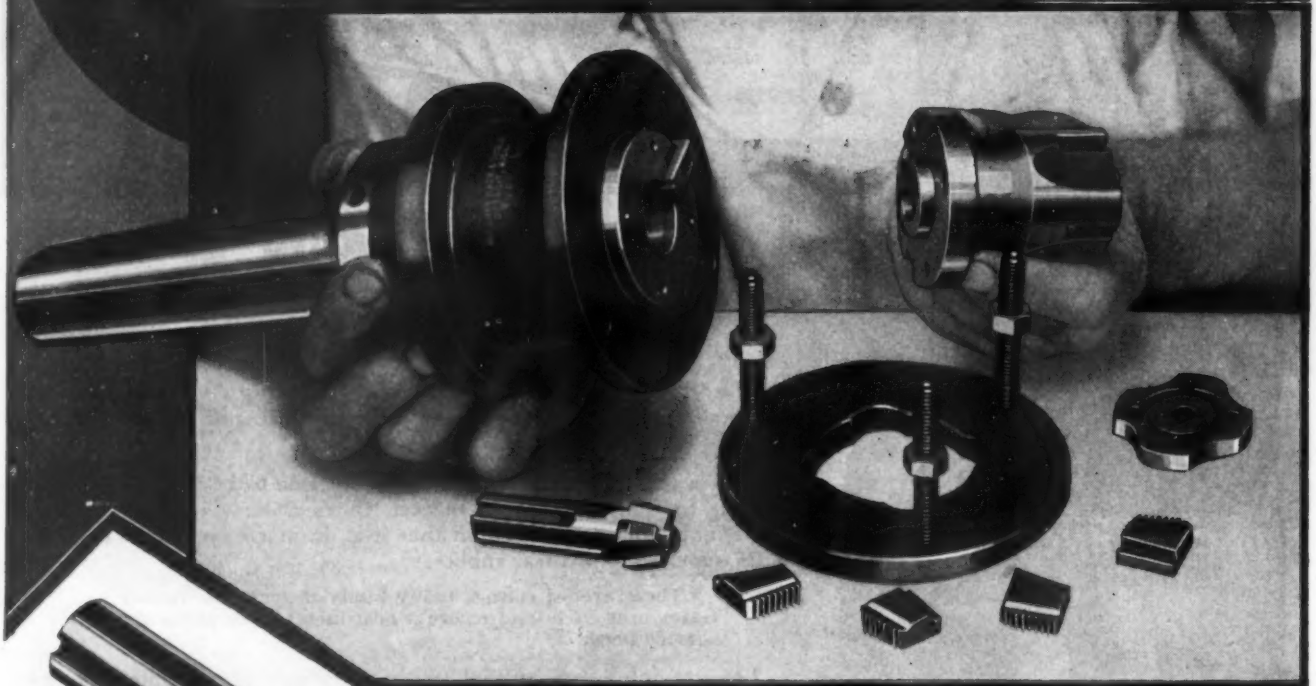
Announcing Murchey

THE NEWEST ACHIEVEMENT BY

15 Threading Sizes in Only 2 Tools

TYPE L COLLAPSIBLE MACHINE TAP



Showing Chaser Bearing on Pin

NEW MECHANICAL FEATURES

Separate nose pieces and two bodies provide threading ranges of 1⅛″ to 6″ in diameter. 15 sizes in all —8 for smaller—7 for larger. Simplified design. Single centralized spring. Fewer pieces. Chasers mechanically stronger. Bearing surface 100% on the pin.

ADVANTAGES OF TYPE L

Flexibility. Better alignment—straighter threads. Greater dependability—trouble-free performance . . . longer life. Can be used on machines with or without lead screws. Tripping mechanism may be operated from face of the work or by the use of a yoke. All exposed surfaces treated with penetrating rust-proofing process.

Write for Complete Information to Dept. A

Murchey also manufactures all types of Collapsible Taps, Self Opening Die Heads and Tapping Machines. Write for literature on any of these products.

MURCHEY MACHINE & TOOL CO.
DETROIT 26, MICHIGAN

MURCHEY

IT'S NOT ONLY *Which* CUTTING MATERIAL

BUT HOW YOU USE IT THAT COUNTS

HAND BOOK OF SPECIAL STEELS

Newly revised and reprinted—a comprehensive book on the properties, uses, and best methods of handling, treatment, etc. of tool, stainless and other alloy steels. Plenty of tables to facilitate quick reference and selection. 136 pages, pocket-sized, latest data.

SEND FOR YOUR COPY

Address Dept. A. M.-29

THERE'S hardly a single cutting operation that can't, in some way, be improved. Our record files contain hundreds of instances. Redesign of the tool itself often works wonders. In other cases, a switch of cutting materials shows a marked increase in production, or in pieces between grinds.

That's the job of our Mill Service organization—to work with you for improvement—and the Allegheny Ludlum line now offers you absolutely complete selection. The range extends from Carmet carbide metal blanks and tipped tools—through ALX cast alloy-metal ground bits—to DBL and Super DBL low-tungsten high speed steels, as well as the various high-tungsten and "moly" types of high speed steels. Call us in, any time, anywhere.

AL

STEEL FOR THE NATION'S WELFARE

Allegheny Ludlum

STEEL CORPORATION

GENERAL OFFICES: BRACKENRIDGE, PENNA.

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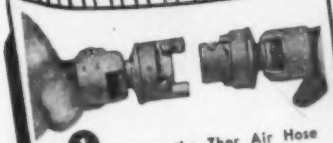
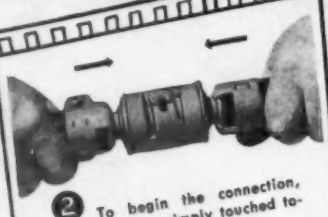
"WATCH THE LUGS!"

for the Simple Secret of SAFER, POSITIVE-LOCK Thor HOSE COUPLINGS

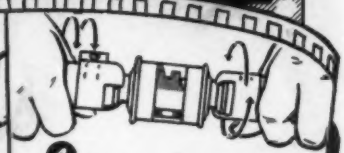


1 This is the Thor Air Hose Coupling about to be quickly assembled. Note the operation is so simple and easy that the operator needs only to hold the hose—not the coupling.



2 To begin the connection, both ends are simply touched together in proper position.

3 A slight push with both hands recedes the sliding sleeves against inner springs (phantom view) and moves the beveled jaws (gray) into position with their respective slots.



4 Presto!—with a slight twist the beveled jaws snap into position, the springs recoil, and the lugs (black) slide up and into positive-lock position.

5 THIS ENTIRE CONNECTING OPERATION OCCURS IN A *FLASH*—ALMOST QUICKER THAN THE EYE CAN SEE IT.

6 Now, to disengage the Thor coupling, all the operator does is pull back the spring-enclosing sleeves to release the lugs from locking position.

7 Now unlocked, with the lugs free of the connection, the beveled jaws automatically release and the coupling comes apart.

Thor
HOSE COUPLINGS

. . . interchangeable between all sizes and combinations up to ¾ inches, inclusive. Each hose end is identical with the other—no right or left . . . no male or female—making a universal coupling. Write today for complete information in Thor Catalog 42-A.

SIMPLE? YES! But in this simplicity of spring-operated locking lugs controlling the beveled jaws lies the *positive-lock* feature that makes the Thor Hose Coupling the *safer . . . perfect* connection. Easy to operate, this Thor coupling will save you both time and money.

Positively locked, it cannot be accidentally disconnected to endanger the operator of the tool. Even if one hose end strikes a snag and the sleeve slides back, the sleeve on the opposite side *stays in position* to retain the connection . . . *because the sleeves must be pulled in opposite directions simultaneously to disengage the locking lugs!*

Thor Portable Pneumatic and Electric Tools

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Macklin Resinoid Cut-off Wheels are available for every Cut-off operation. They cut fast and cool, slicing their way through the hardest of metals with minimum wheel wear.

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FOR EVERY GRINDING PURPOSE WILL

"Protect your Production"

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Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

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STUD SETTING IN AIRCRAFT PRODUCTION IS SPEEDED UP WITH MODERN SELF-OPENING STUD SETTERS . . . .

By driving studs the "MODERN" power way, slow, laborious and costly hand methods are eliminated, and great savings in time, labor and money are assured.

MODERN STUD SETTERS in the Packard Plant contribute to the overall production efficiency in turning out Rolls Royce Engines. Packard is using the same method in setting studs in aircraft engines as the automobile manufacturers have used for many years.

●

Write for detailed information on the MODERN Stud Setter. You'll be interested in how and why it provides a proved means of stepping up production.

MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

VERNIER CALIPER

THIN, HARDENED AND GROUND JAWS FOR MAKING ACCURATE MEASUREMENTS.

INSIDE DIAMETER MEASURING JAWS FORM SINGLE POINT WHEN CLOSED.

VERNIER READS DIRECT TO .001 IN. HAS THUMB CONTROL FOR JAW SLIDE.

VERNIER ADJUSTMENT SCREWS ALLOW EASY CLEANING AND RESETTING.

ALL WORKING SURFACES ARE HARDENED, GROUND AND LAPPED.

ENGRAVING CLEAR, READABLE AND ACCURATE.

6 IN. DEPTH PROJECTION ROD WITH RELIEVED POINT. READ SCALE DIRECTLY FOR MEASUREMENT.

VARD is glad to announce that its precision-built Vernier Caliper is now available for general sale.

This is a pocket type instrument, measuring a full 6 inches inside or outside measurement. In addition, it has a 6 inch depth projection rod with relieved point which is read directly on the face scale of the tool.

This VARD caliper has a Vernier with thumb control which permits accurate measurements to .001 of an inch.

Engraving is clear, readable and accurate. All working surfaces are hardened, ground and lapped.

Write for descriptive literature and price sheet.

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With a set of DoALL Gage Blocks and Instruments, you can make in 5 to 10 minutes any size temporary snap gage that is accurate to within a few micro inches, more accurate than a fixed gage that costs $50 to $100. Think of it—you can save this cost as well as hundreds of valuable hours waiting to have fixed gages made.

SCRIBER

Trammel points and scriber are only a few DoALL instruments. Used to lay out thousands of different radii of micro inch dimensions, also to check location of tiny holes, points, arcs, etc.

DoALL GAGE BLOCKS

Set of 83 blocks and 20 auxiliary instruments in a compact case will put your shop abreast of the best when it comes to designing, making and inspecting precision tools and interchangeable parts for war or peacetime equipment.

FREE Inspection Handbook. All about the use and care of Gage Blocks. Just ask for a copy of "Quality Control".

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Manufacturers of DoAll Contour Machines and Surface Grinders. Offices in Principal Cities

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ACCURATE

on straight, spiral or taper work because the ball and socket sliding member eliminates all lost motion. Made in two sizes with #10, #11 and #12 B&S shank; also with #40 spindle.

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IRANISTAN & R. R. AVENUES,
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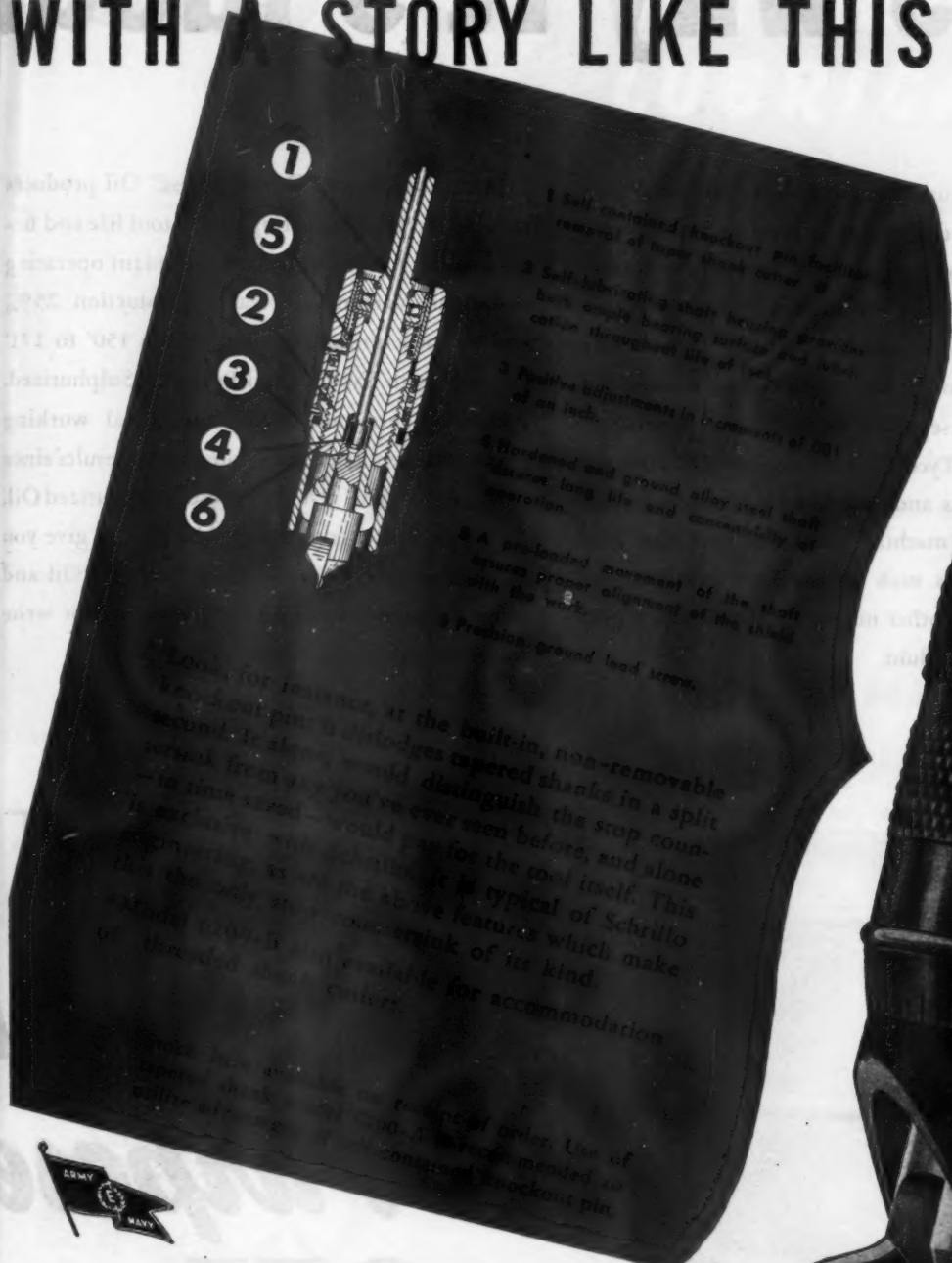
Available from Stock
= 0-80 and = 1-72
SCREWS and NUTS
Brass or Steel, Cut Thread
Class 3 Fit

Waltham is also equipped to furnish all types of
SPECIAL MACHINE SCREWS and SCREW MACHINE WORK
manufactured to special order.

Write for Catalog and Price List.

WALTHAM SCREW CO.
WALTHAM, MASS.

ONLY ONE STOP COUNTERSINK WITH A STORY LIKE THIS



Schrillo maintains complete factory rebuilding service—assures a tool comparable to the original unit.

Patent Applied for

Send for complete information. Literature on complete Schrillo line is available. Write on your firm letterhead, please Schrillo Aero Tool Engineering Co., 8715 Melrose Avenue, Los Angeles 46, California

SCHRILLO

LOS ANGELES CALIFORNIA

Here's why it's ideal f

THERE'S a unique quality to Tycol "Dual Purpose" Oil that makes it ideal as both cutting oil and machine lubricant. It contains the correct amount of sulphur for excellent cutting – BUT the sulphur is in *combined* form. *permanently* incorporated in the oil. It cannot be filtered out – it will not separate in service or in storage.

That's why Tycol "Dual Purpose" Oil does not corrode ferrous and non-ferrous metals – neither the work nor machine gears and bearings. And that's why it is such an excellent lubricant for automatics and other machines, as well as a highly efficient cutting fluid.

In cutting, Tycol "Dual Purpose" Oil produces notable increases in cutting speed, tool life and finish quality. As an illustration, one plant operating automatic machines increased production 25%, and stepped up surface speeds from 150' to 171' per min. with Tycol "Dual Purpose" Sulphurized. And there are numerous other metal working plants that report equally noteworthy results since changing to Tycol "Dual Purpose" Sulphurized Oil.

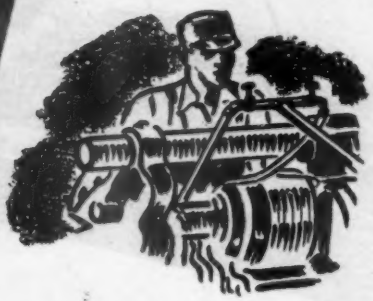
A Tide Water engineer will be glad to give you all the facts about Tycol "Dual Purpose" Oil and other Tycol industrial oils. Why not call or write today to your nearest Tide Water Office?

TYCOL
Dual Purpose
OIL

TIDE WATER
MAKERS OF
THE FAMOUS VEEDOL MOTOR OIL

for both CUTTING AND LUBRICATION

FREER CUTTING, LENGTHENS TOOL LIFE



By minimizing build-up on cutting tools, Tycol "Dual Purpose" Sulphurized Oil permits faster cutting—lengthens tool life between grinds.

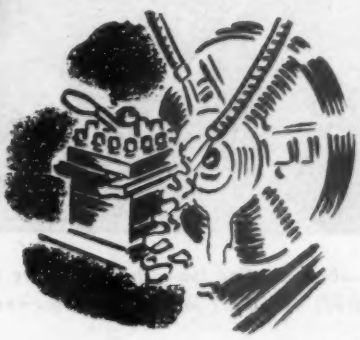
★ ★ ★

PROTECTS BEARINGS AND GEARS,

won't corrode, won't gum or form harmful deposits on copper or copper alloy machine parts.

★ ★ ★

EXCELLENT WITH CARBIDE TOOLS



Tycol "Dual Purpose" brings out the best cutting performance of carbide tools, without attacking the binder.

Gasoline Powers The Attack— Don't Waste A Drop

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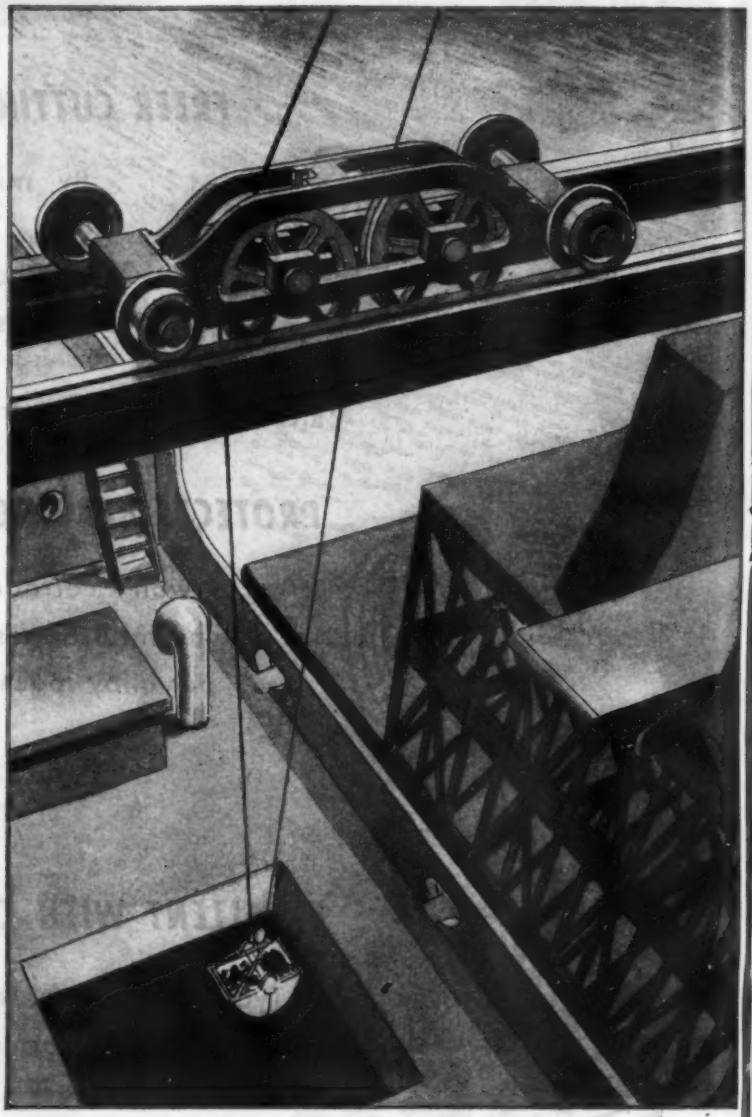
Two Hard-Faced Sheaves Outlast 40 Ordinary Sheaves

$1,000 Saved By Protecting Grooves with HAYNES STELLITE Alloy

The grooves of two 33-in. diameter sheaves on a coke-unloading tower were hard-faced with HAYNES STELLITE alloy thirteen years ago, and still show no serious wear. It has been estimated from records that the two hard-faced sheaves have outlasted at least forty ordinary sheaves.

Previously three or four sheaves were worn out each year, because of the abrasive wear of the cable against the wheel. The cost of each sheave was twenty dollars, plus $7.50 for the labor of installing it, or a total of $1,100 for forty.

Hard-facing the sheaves not only saved this expenditure, but in addition, reduced wear on the ¾-in. cable used, due to the low coefficient of friction of HAYNES STELLITE alloy. There are many applications in which hard-facing with HAYNES STELLITE rod can duplicate these savings; wherever equipment is subject to excessive abrasion, its life can be increased when the smooth, hard surface layer of HAYNES STELLITE alloy is applied at the points of wear. Write for the booklet "Hard-Facing With HAYNES STELLITE Company Products" . . . it will suggest ways in which you can save money by using these hard-facing rods.



Hard-facing the sheaves on this coke unloading tower prolonged the life of the steel cable and saved hundreds of dollars in sheave replacements.

★

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HARD-FACING RODS FOR EVERY PURPOSE

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It's surprising how many Disston products, directly or indirectly, spell BAD NEWS for the Nipponese and the Nazis.

Somewhere, a lumberjack cuts a tree with a Disston saw. Soon that tree is being chopped into chips with Disston Super-Safe Chipper Knives. Somebody makes those chips into nitro-cellulose used in making smokeless gun powder which goes to a war ship. And some of the gun parts and armor plate on that same ship may be made of Disston Steel. In fact, Disston files, hack saw blades and other tools may have helped to build that ship and much of its equipment. But now . . .

Let's Talk About Chipper Knives

Disston skill and Disston steel have produced Chipper Knives with these time- and money-saving features: they are easier to grind; they have higher heat resistance; they stay sharp longer; they are super-safe; they produce *more uniform chips* and *less dust.*

The same kind of skill with steel, the same experience and expert engineering, which produce Disston Super-Safe Chipper Knives are used in making Disston *standard tools.* Perhaps *your* plant needs better circular saws or band saws, better files, hack saw blades or other tools. Sooner or later, you'll discover that Disston tools are the best answer. Why not write us about your needs *now?* Address Henry Disston & Sons, Inc., 820 Tacony, Philadelphia 35, Pa., U. S. A.

DISSTON

Conserve Man-Minutes and help win the war

Why Blue Flash Mounted Wheels and Points Pay Off in Greenbacks

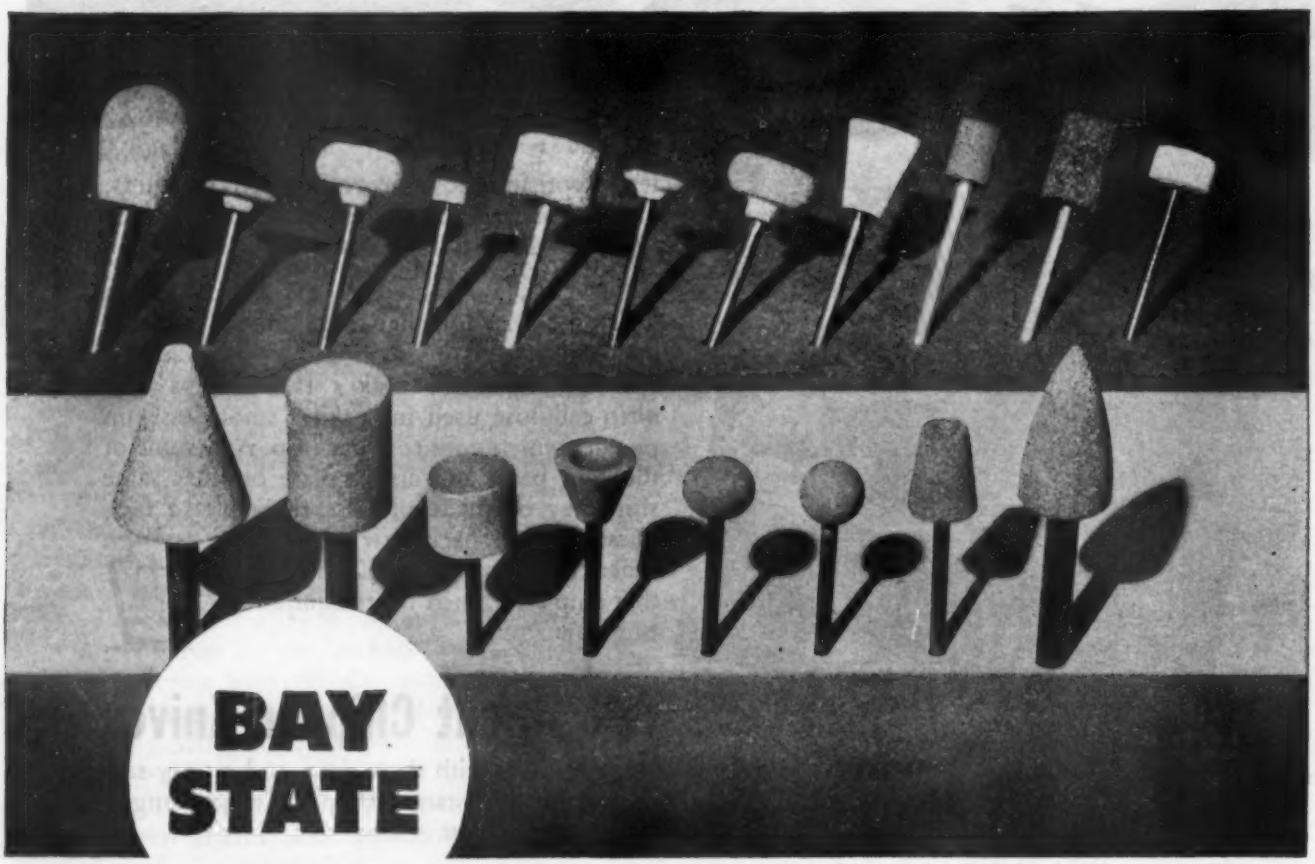
Blue Flash mounted wheels and points are ready for immediate cutting action as soon as you receive them. There is no wasteful "breaking in" period. What's more, they are free from hard and soft spots.

These unique features are the result of Bay State's special manufacturing process . . . Blue Flash mounted wheels and points are first made into uniform blanks (rather than pressed into shape form) . . . then, after mounting on mandrels, their grinding surfaces are trued to size and shape. The result . . . sharp, smooth-running, more efficient wheels that pay off in greenbacks, because they save valuable time and do more work for the money.

Extra advantages like these will be found throughout the entire line of Blue Flash products . . . advantages that have earned Bay State a position of leadership for quality . . . the finest honing and superfinishing stones ever manufactured . . . portable snagging wheels with extra safety features . . . precision grinding wheels in fractional grades, etc.

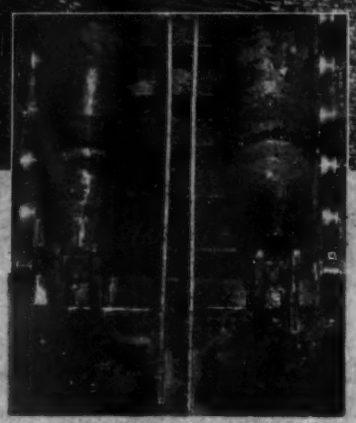
Check complete details on how Blue Flash Mounted Wheels and Points "pay off in greenbacks". Send for pocket-size catalog D.

BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASS.



BLUE FLASH GRINDING WHEELS *FAST and COOL*

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS
MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS AND CYLINDERS



"With Gulf Super-Quench we get more uniform hardness and improved machinability"

says this shell plant heat treating Superintendent

VARIATIONS IN HARDNESS with conventional quenching oils resulted in unsatisfactory tool life in the machine shop," says the heat treating Superintendent of American Manufacturing Company, Fort Worth, Texas. "With Gulf Super-Quench we get uniform hardness in every shell, which has led to a substantial increase in tool life."

Another heat treating problem solved with Gulf Super-Quench! And additional evidence that it pays to equip your plant with this revolutionary new quenching oil.

Here's why Gulf Super-Quench is a superior quenching oil: It has intensified dual-action—a faster cooling rate through the hardening temperature range, and the slow speed of conventional quenching oil below the hardening temperature range. Call in a Gulf Service Engineer today and let him show you how Gulf Super-Quench can help improve your quenching practice. For your copy of the brochure on Gulf Super-Quench, send the coupon below.

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The need for special devices in conveying systems, increased during these war years of fast and tremendous production, has found Mathews Engineering ready and eager for the job. Frequently, the conveying problems have been entirely new. Always, they have been different in some respects from even the most similar jobs in the past. The conveyers were needed quickly and the need was great. To meet this need, Mathews Engineers and production personnel have hammered away steadily, meeting these problems as they came, and solving them. As a result of this activity — these new problems — these special devices which were developed — many years of experience have been packed into a short while. That is why Mathews methods are up to the minute. This experience is available, through the Mathews Field Engineer, in all principal cities in the United States and Canada.

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with 1,000 combinations of current and voltage instantly available without a "dead spot" in entire welding range.

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Smooth, Simultaneous

★BURRING
★FINISHING ★POLISHING

THIS BRIGHTBOY WHEEL was purposely split to show the even impregnation of the abrasive clear through its resilient rubber binder.

Rubber-Cushioned Brightboy *Does It!*

Brightboy's balanced rubber and abrasive combination enables you to cover simultaneously the production steps between the grind and the buff.

Interesting production literature gives you detailed information on Brightboy's time and labor-saving short-cuts. The price list and catalog tabulate and illustrate the wide variety of shapes and sizes in which Brightboy is made for extensive machine and manual applications. Write for this information. And if you have a special problem, Brightboy dealer representatives and service men will be glad to work with you, without obligation.

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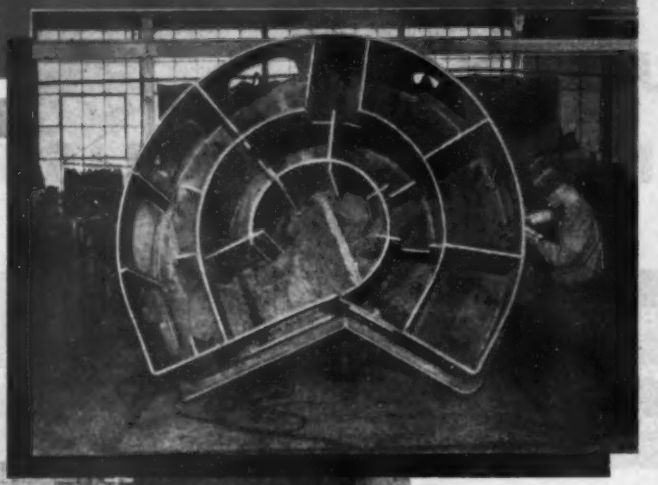
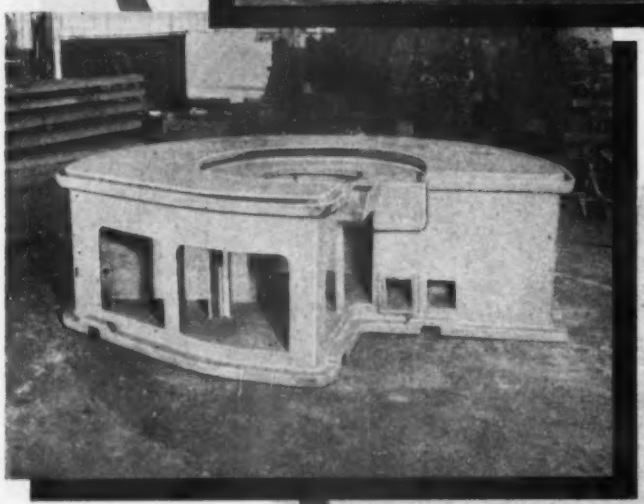
SINCE 1913

Seasoned welding engineers and operators plus complete facilities to handle almost any weldment — large, heavy or of complicated design. Illustrated literature, showing many products successfully fabricated, upon request.





Machine base for drilling machine with trough around top.

Walls ⅝" plate
Top 1¾" plate
Weight 7825 lbs.

Lighter, stronger, better styling, usually less costly—are the main objectives when you weld all or part of a product—and those objectives are almost invariably attained.

That redesigned pre-war product of yours—that entirely new post-war design—weld it, if at all possible.

Go over your drawings. See what can be done. Better still, permit a United engineer to study your prints and make suggestions. If welding is not feasible, he will say so.

ARMY E NAVY

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MIDDLETOWN, OHIO

WELDING FABRICATORS OF MODERN DESIGNS

IMMEDIATE DELIVERY

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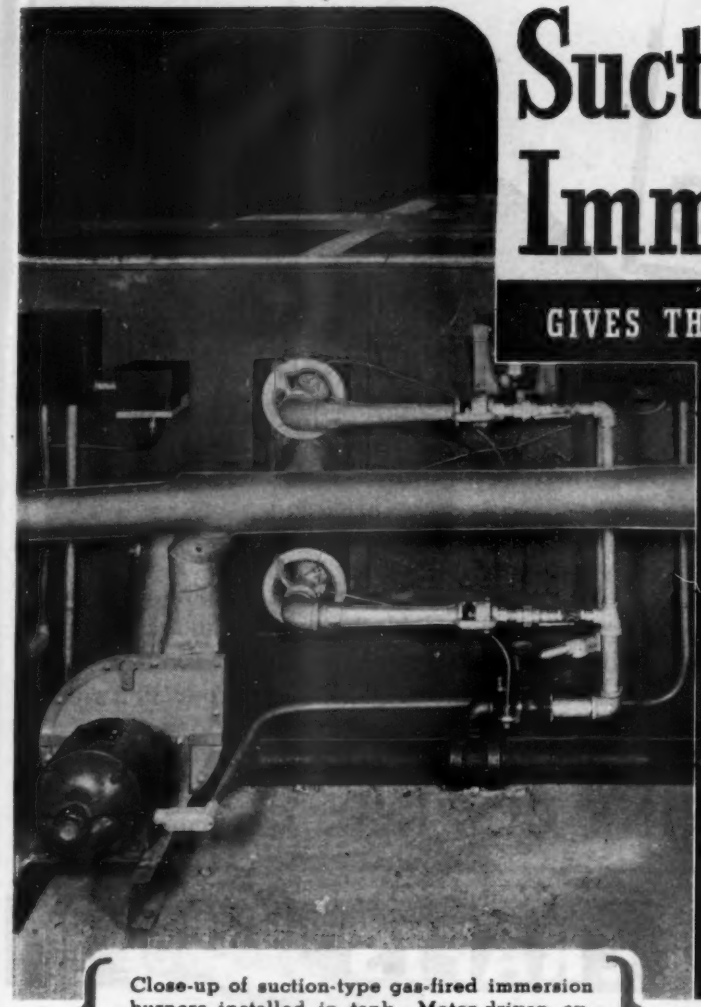
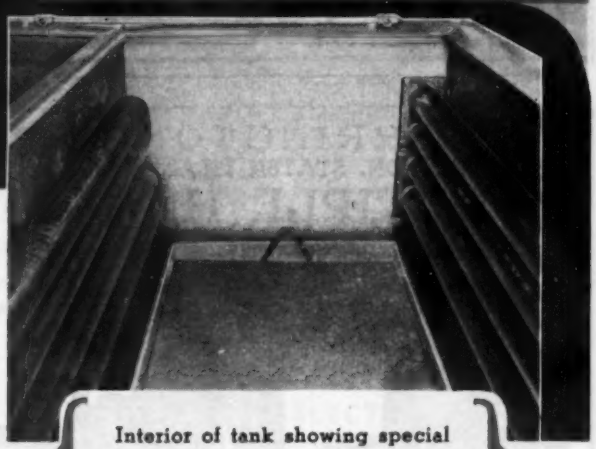
GIVES THESE OUTSTANDING ADVANTAGES:

1. Greatest heat input at maximum efficiency with minimum space for heating coils.
2. Diffusion combustion within coil prevents development of excessive temperature at any point. This eliminates danger of overheating sensitive solutions.
3. Easy to install... maintenance reduced... efficiency increased and cost of operation lowered.



Close-up of suction-type gas-fired immersion burners installed in tank. Motor-driven exhauster system is also shown.



Interior of tank showing special immersion tubes.

Wherever immersion heating elements are used... in wash tanks, oil heating tanks, evaporator pans, spray and alkali washers, corrosion-resisting processes, or any solution heating, these new, improved, gas-fired immersion burners are the logical selection.

The New Improved Surface Combustion Atmospheric Immersion Burners also give increased capacity and performance. Write for complete details on either type.

The Heat Treater's Helping Hand

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Standard and Special Industrial Furnace Equipment For:
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Manufactured in all tapers and sizes.

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QUADRO LIVE CENTERS combine the rigidity of the solid lathe center with the frictionless properties of the ball bearing to form a tool which will increase production without sacrificing accuracy.

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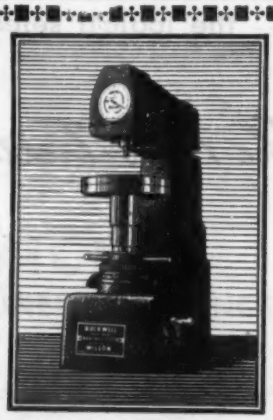
These new improved type testers available from stock.

Made by us for 23 years and still made by us only.



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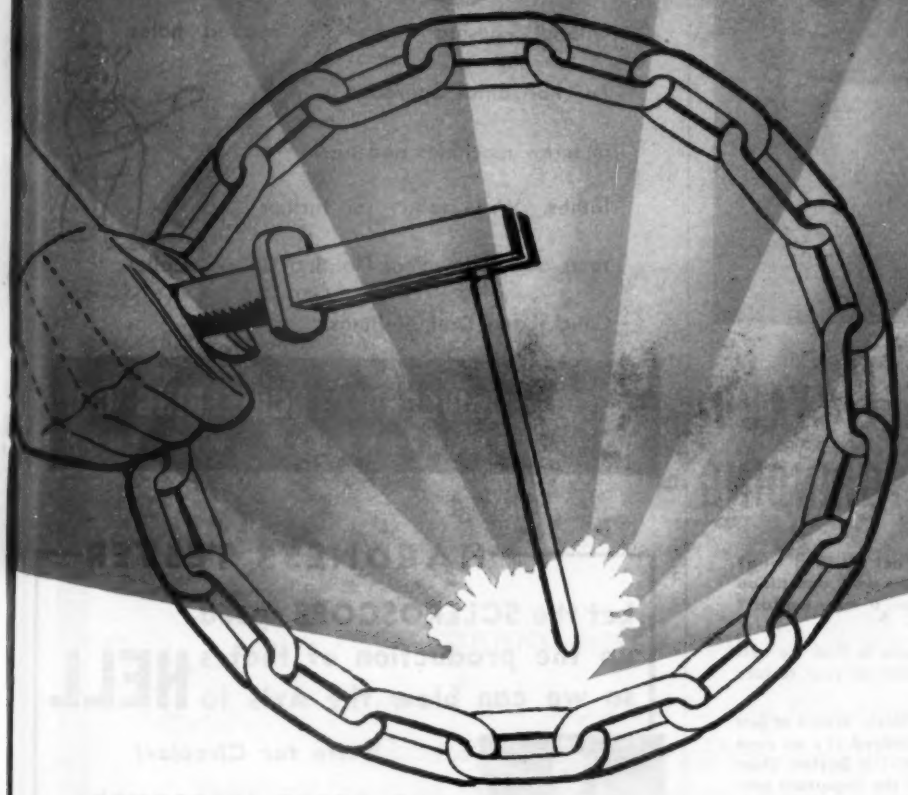
An Associate Company of American Chain & Cable Company, Inc.

NOW you can GET these McKay Welding Electrodes



These Commercial Grades of Stainless and Mild Steel Welding Electrodes are now available.

McKAY STAINLESS STEEL ELECTRODES

(All Diameters .075"* to ⅛")

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15-35, Type 330
15-60
25-12, Type 309
25-20, Low Carbon-Heat Resistant

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McKAY MILD STEEL ELECTRODES

(All Diameters 3/32"* to 5/16")

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No. 17—A.W.S., E-6012
No. 116—A.W.S., E-6012 & E-6013
No. 3—A.W.S., E-4520 in straightened and cut lengths or coil form for automatics
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*We can now give good service on orders for small sizes such as—.075" and 3/32", formerly so hard to get, because of recent increases in our capacity for producing the smaller diameters.

An easing supply situation now makes McKay Stainless and Mild Steel Electrodes available for commercial purposes. A list of these two grades for nearly every type of arc welding, appears at the right.

If you have been having trouble obtaining the Electrodes you require, here is an opportunity to get these grades from The McKay "researched line." Inventories are being gradually built up which should permit a more consistent supply of most of these analyses both now and in the future.

Your inquiry or order will receive prompt attention.

General Sales Office: York, Pa.

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PITTSBURGH, PA.

WELDING ELECTRODES . . . COMMERCIAL CHAINS . . . TIRE CHAINS

NOW—A PROVEN WHEEL "YARDSTICK" FOR SURFACE GRINDING

Do you have a surfacing job that you are not satisfied with? Does the wheel you are using tend to burn the work and fill up too quickly? Remove metal too slowly? Or does it wear too fast? Or leave a finish below your requirements?

If so, why not do what so many have done to find the best wheel for the job? Use the 846 K-1-V Dayton as your surface grinding "yardstick."

It cuts cool and fast. Gives an excellent finish. Wears at just about the right rate for topmost efficiency. Indeed, it's an even bet you will want to standardize on this 846 K-1-V Dayton. Short of that, it provides such a close measure of the important performance factors that repeated guesswork in wheel selection is usually eliminated.

The 846 K-1-V Dayton is made in a wide range of sizes—with trial wheels shipped from stock. Write, wire or phone.

SIMONDS WORDEN WHITE CO.
712 NEGLEY PLACE, DAYTON, OHIO

DAYTON CENTERLESS WHEELS

THE DAYTON WHEEL LINE
SURFACING
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DAYTON GRINDING WHEELS

Universal Floating Chucks drill, counter-bore, ream or pilot from a lead hole. Adjustable pressure compensates for tool weight, allows increased feed without causing marred holes. For horizontal operation in screw machines and turret lathes. Write today for further facts about Universal Floating Chucks, Collet Chucks and Drill Bushings.

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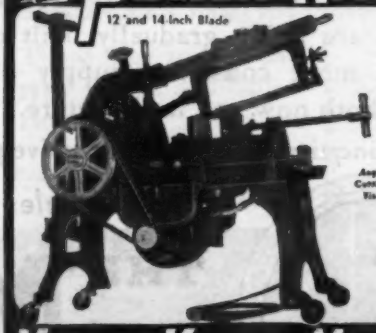
12 and 14-inch Blade



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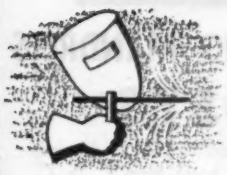
PAGE *Welding* ELECTRODES



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But don't overlook the important value to you of the **PAGE** coating on these electrodes—sufficiently heavy to provide the shield necessary to prevent oxidation; to provide the protection of easily removed slag that permits more cooling time; that eliminates surface checking, and that holds spatter loss to a minimum.

PAGE ALLEGHENY STAINLESS STEEL ELECTRODES provide the metal you want, help you get it where you want it and protect the job your men do. Ask your local **PAGE** Distributor.

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Universal Swivelling Magnetic Chuck for Tool Room

Standard units for practically any service requirement are available from Walker because of the completeness and diversity of the Walker line.

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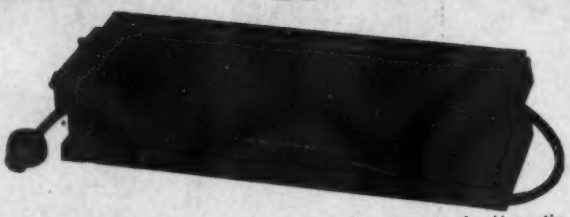
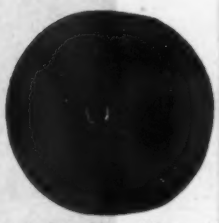
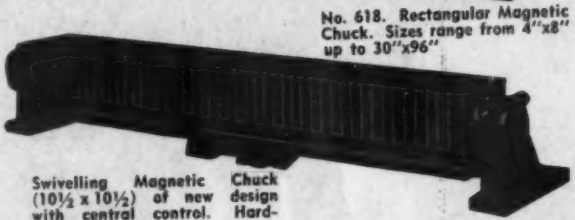


No. 618. Rectangular Magnetic Chuck. Sizes range from 4"x8" up to 30"x96"



Style D Face Plate. "Concentric Gap" Type



Swivelling Magnetic Chuck (10½ x 10½) of new design with central control. Hand-wheel operated.

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The "Sure-Set" HOLDER

"Sure-Set" Adjuster, Plastic, Applies Desired Pressure
Slotted Construction Prevents Binding or Distortion of Type
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Matthews new "Sure-Set" Holder, of polished black plastic, fills a need for industrial stamping applications, where acid etching or conventional inks are used to secure a printed impression. Also, where hand stamps, ordinary friction type holders, or individual hand stamps are now used. Made in three sizes for holding characters from 3/64" to 1/2" in size. Holds two or more lines of type, if desired.

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As Handy as Micrometers
Reset for each new job or
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Each gage in case with complete set of rods to gage all sizes within frame limits

Gage and 8 rods to gage all sizes from 0" to 3/4" $18.00
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Immediate Delivery

6½" MASTER VISE
$32.55

- Graduated Base—can be used plain or swivel
- Width of Jaws, 6½ inches
- Depth of Jaws, 2 inches
- Opens with Steel Jaws, 4 inches—without, 5¼ inches
- Weight complete with crank, boxed, 90 lbs.

4½" JUNIOR VISE
$23.60

- Graduated Base, can be used either plain or swivel
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These sturdy vises are ideally suited to Milling Machine, Drill Press and Shaper Jobs. The vise jaws are hardened steel and the large Acme steel screw contributes durability to both the large and small vise. Four bolt and key slots are provided to attach the vise rigidly to the machine table, so that work holding surfaces are at true right angles to the table.

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Gilmore complete service is made possible through the facilities of a complete plant equipped with every modern method for handling the highly specialized work involved in tool making and cutting of diamonds. From diamond selection by experts to final inspection, all Gilmore Diamond Tools are entrusted to men capable by experience to bring them to the highest degree of completed perfection.

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Desmond Cutters

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We manufacture a complete line of Dressers and Cutters. Write for copy of catalog "A".

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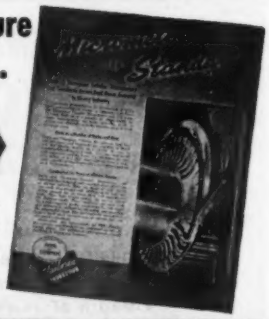
How to Accurately Measure Large* Unwieldy Parts...

* Up to 168"

...is explained in this **FREE BOOKLET**



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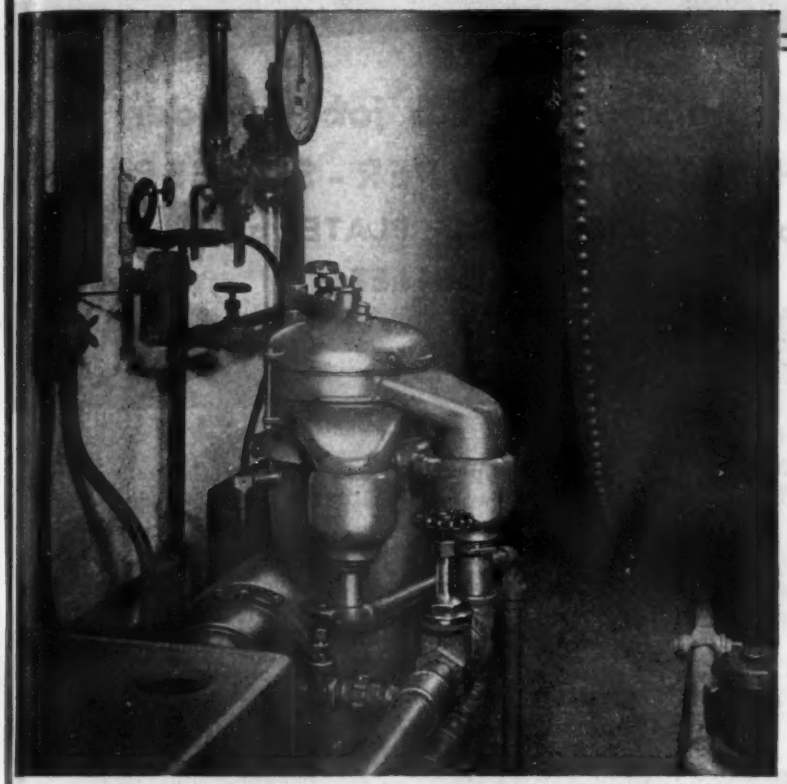
...the "Science of Application"...

brings out the best in cutting fluids!



A corner of the oil purification room at Warner & Swasey Company, Cleveland, showing the De Laval Oil Purifier used to maintain cutting oil, hydraulic oil, and general lubricating oil.

PURIFICATION of FACTORY OILS SAVES MORE THAN THE OIL...

WHEN factory oils are purified by means of a De Laval Centrifugal Oil Purifier, impurities and water are instantaneously removed and the oil can safely be used over and over again. This is in itself a sufficiently profitable reason for purifying factory oils the De Laval way.

But equally important is the effect on tools and on the work. Purification of cutting oil, for example, often doubles the life of the tool; it reduces machine "down time" and insures more consistently accurate work.

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Details are available in Bulletin FF-25. Write for your free copy.

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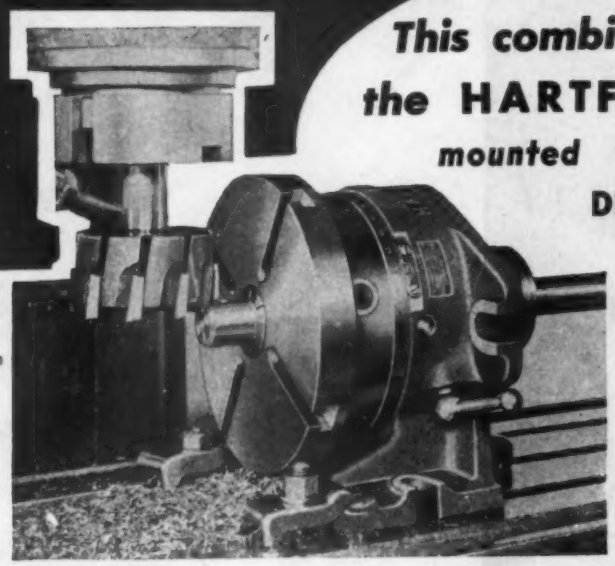
De Laval PURIFIERS *and* CLARIFIERS *FOR FACTORY OILS*

FOR GREATER OPERATING EFFICIENCY

This combination is a job speeder
the HARTFORD SUPER-SPACER
mounted with FACE PLATE and DRAW-IN COLLET



You will be interested in the adaptation of the HARTFORD SUPER-SPACER to the wide range of operations it can handle and the various attachments available for use with it. *Write at once for detailed information.*

Here is a typical example of how the inherent adaptability of the HARTFORD SUPER-SPACER is further extended through the use of available attachments. In this case the HARTFORD FACE PLATE and DRAWN-IN COLLET combination is employed for vertical milling on bar stock. Work is held securely during cutting and indexing operations are quickly and accurately handled. Simplicity and ease of indexing make the "HARTFORD" highly advantageous even in the hands of unskilled operators.

THE HARTFORD SPECIAL MACHINERY COMPANY
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If you are now stripping anodizing film from aluminum racks or rejects, it will pay you to investigate the SAFER, FASTER, Oakite technique specially developed for this purpose.

Merely immerse the anodized parts to be stripped in recommended solution of Oakite Compound No. 84 as directed. Then remove, rinse, and you will note that all film is gone. Standard electrolytic tests will show electrical conductivity is fully restored, without injury to basis metal. Free details!

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Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on page 288 Aug. 17 '54 American Machinist

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5 in., 6 in. and 7 in. sizes
All parts Interchangeable
JOHN B. STEVENS INC.
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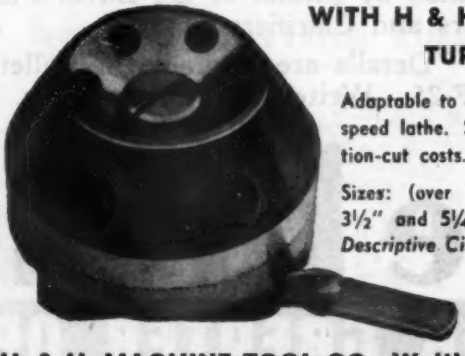
MAKE YOUR LATHES MORE PRODUCTIVE WITH H & H 6 TOOL TURRETS



Adaptable to any engine or speed lathe. Speed production-cut costs.

Sizes: (over all dia.) 3", 3½" and 5¼". *Write for Descriptive Circular.*

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it does both jobs!

Power Source for Automatic Welding Heads

General Purpose AC Welder

The WILSON "*BUMBLEBEE*"

TRANSFORMER AC WELDER

Here's what makes the Wilson "Bumblebee" your best choice in AC welding machines:

1. It's a production-boosting, AC welder that provides 15% to 30% more welding per work day, with reduced power costs. Because of its high electrical efficiency and improved power factor, it uses 30% to 35% less power to do the same work as an equivalent DC machine.

2. It's also highly recommended by the majority of manufacturers of automatic welding units as an ideal transformer to use with their equipment. A number of 300 or 500 ampere "Bumblebee" machines, connected in parallel, will furnish ample power for your automatic welders.

This flexibility offered by the "Bumblebee," plus its sturdy, trouble-free construction – high electrical efficiency – and improved power factor, make it an excellent welder for every modern metal-working plant. Be sure to mail the coupon for free catalog that gives full details. Other Wilson AC welders are made in sizes from 100 to 1000 amperes.

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Gentlemen:

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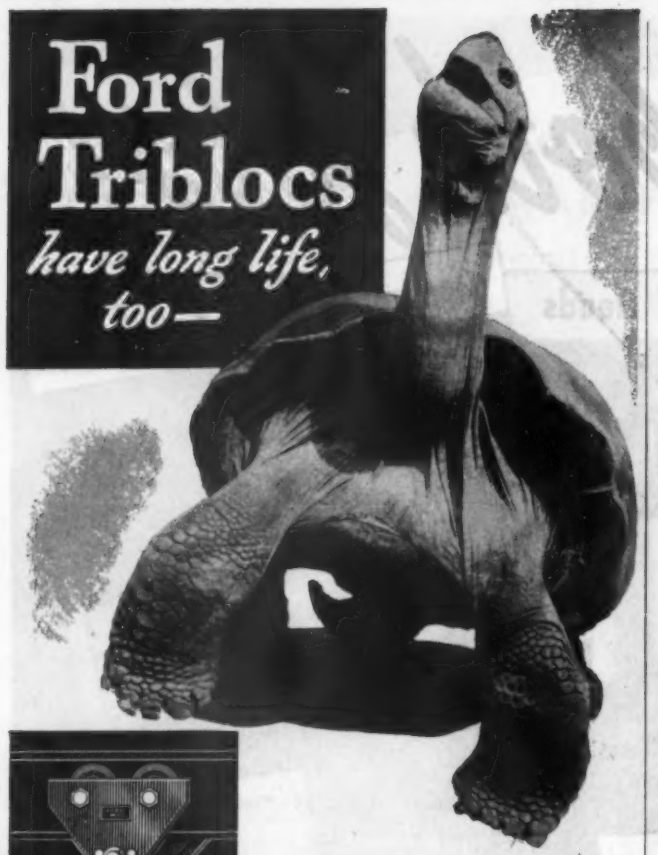
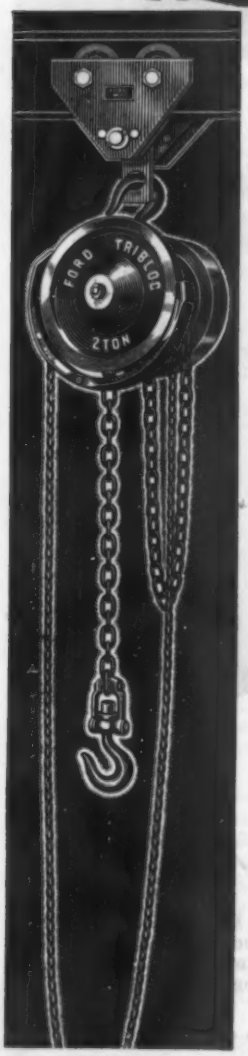
Ford Triblocs
have long life, too—





The giant tortoise is famed for its long life. Ford Triblocs have amazing endurance, too. Given proper care—they are up on your ceiling for many long years of service. They are ideal for constant hard usage. Spur gear construction, ball-bearing equipped, and many other features that assure enduring efficiency, safety and low maintenance cost. Capacities: ¼ to 40 tons.

FORD SCREW HOISTS are built primarily for jobs on which smooth operation and accurate spotting of loads are required. Lightweight; highly portable. Capacities: ½ to 5 tons.

FORD DIFFERENTIAL HOISTS are constructed for intermittent service where speed, portability and price count. Capacities: ¼ to 2 tons.

FORD HOISTS are manufactured by Ford Chain Block Division, American Chain & Cable, Bridgeport. Offices at Philadelphia, Chicago, Denver, Los Angeles, Portland, San Francisco.

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• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

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Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

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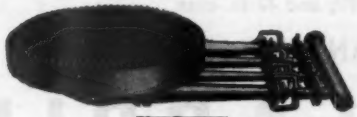
For Many Industrial Gas Uses

NO BLOWER or POWER NECESSARY
. . . just connect to gas supply

Pipe Burners

Nozzle Burners



Ring Burners

Designed to solve numerous Industrial Gas applications, "BUZZER" Burners are unexcelled for Efficiency, Economy, Simplicity and Flexibility. Large variety of models available.

Send for the "BUZZER" Catalog showing complete line of Industrial Gas Burners, Furnaces and other equipment.

CHARLES A. HONES, INC.
121 So. Grand Ave. Baldwin, L. I., N. Y.

SAD, SAD INDEED . .

DUST GRIT

—is the plight of Dust and Grit when the AIR MASTER is installed on your grinding and buffing machines. No longer can these two destroyers of health and machinery menace your plant. No longer can these destructive saboteurs, Dust and Grit, cause absenteeism and expensive machinery breakdowns. The AIR MASTER liquidates them—definitely and completely.

What is sad for Dust and Grit is good for you. The Cincinnati AIR MASTER sucks up Dust and Grit right off your grinder and buffer wheels—and does it right at the moment they fly off the wheels. Human lungs and sensitive moving parts and bearings on expensive machinery are no longer injured by these flying destroyers.

NOW AVAILABLE: Two, three and five H.P. grinders and buffers on AA-5 priority or better.

The AIR MASTER is fully self-contained . . . efficient, rugged, dependable.

A Size For Every Grinder or Buffer

Write today for full details.

The Cincinnati
ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOLS
The Cincinnati Electrical Tool Co.
DIVISION OF THE R. K. LEBLOND MACHINE TOOL CO. CINCINNATI, OHIO
4010 MADISON RD.

LUERS

Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under License Issued by John Milton Luers Patents Inc.

Your Copy FREE on Request

DRILL JIG **BUSHINGS**

ABC TRADE MARK

MAIL COUPON TODAY!

A.S.A. STANDARD

ACCURATE BUSHING CO., 440 North Ave., Garwood, New Jersey
Gentlemen: Kindly send me your new FREE Catalog covering A.B.C. Drill Jig Bushings

Name .....
Position .....
Company .....
Address .....

Let's
BACK THE ATTACK
***By Buying* WAR BONDS**

Model C

RANDALL and STICKNEY
Dial Gauges and Indicators

are accurate, reliable and built to stand the gaff of hard usage.

This Model C Dial Indicator has a 2⅛ in. diameter dial, with 50 or 100 divisions. Can be furnished in graduations of .001-in., .005 in. or .01 mm. Has a ½-in. range, movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units, so that repairs can be made easily.

There is a R. & S. Gauge for practically every purpose. Write for catalog describing our complete line.

RANDALL & STICKNEY
Waltham, Mass., U. S. A.
Makers of Dial Gauges Since 1885

CRITERION *Boring Heads*

TOOLS of *Quality* for *Quantity* PRODUCTION

Noted for maintaining original accuracy over a longer period. Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. LEAD SCREW IS HARDENED TOOL STEEL, WITH THREADS GROUND FROM SOLID AFTER HARDENING. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

CRITERION
MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

CHROME PLATE

LAPPING COMPOUND

GRADE NO. 38-900A

A new Compound with a NEW abrasive sharp enough to lap and polish hardened materials, mitrided, chrome plate etc. Gages — Dies — Aviation Parts — yet fine enough for final finishing.

This compound has a special heavy oily paste base especially made for dilution with kerosene, spindle oils.

Large glass jars	$1.00 each
8½ and 42 lb. cans	.90 per lb.

HAND • PLATE • MACHINE

LAPPING

"LMKT" LAPPING LUBRICANT

A substitute for sperm oil on lapping operations.

Single gallon cans	$2.00 each
6 gallon order	1.75 per gal.

Recommended for use on Norton Lapping Machines.

UNITED STATES PRODUCTS CO.
518 MELWOOD ST. PITTSBURGH, PENNA.

Almond Drill Chuck

Write for further information.

. . for over 70 years

ALMOND THREE-JAW DRILL CHUCKS—the first to be placed on the market more than seventy years ago—pioneered the field of drill chucks. During all these many years, ALMOND CHUCKS have continued to be a necessary part in the logical procedure of machine developments.

Made in types and sizes to fit all machine tools and portable drills.

The Original Manufacturers of Drill Chucks

T. R. ALMOND MFG. CO.
Ashburnham, Mass., U.S.A.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

(Not available for equipment advertising)

10 cents a word minimum charge $2.00. (See ¶ on Box Numbers.)

POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.

PROPOSALS. 50 cents a line an insertion.

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The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A. M. August 30th will appear in the issue of September 14th subject to limitations of space available

POSITIONS VACANT

DESIGN ENGINEER. Georgia manufacturer needs man experienced in design and manufacture of jigs, fixtures and special production machinery and who is well acquainted with designing small commercial products of a mechanical nature. Graduate mechanical engineer preferred; or equivalent qualifications. Although plant now doing war work this is a postwar opportunity with long established company whose peace time products have international distribution. To arrange for personal interview write giving education, present and past jobs, detailed experience, age, salary expected and other pertinent information. Send snapshot if possible. P-919, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PLANT SUPERINTENDENT: For old established Midwest manufacturer. Must be experienced in modern shop methods and have ability to successfully organize production of thirty to fifty employees. Excellent equipment includes turret lathes, engine lathes, mills, grinders, drill presses, latest heat treating equipment etc. Excellent opportunity with post-war production scheduled. State age, experience, when available and minimum salary required. P-917, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

DIE DESIGNER: Position requires a broad experience in form, emboss, draw and coining dies, with a shop die-making experience background. Must present priority referred from U.S.E.S. P-918, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 34 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details, R. W. Bixby, Inc., 266 Delaware Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

MANUFACTURING EXECUTIVE desires new connection as chief engineer or production engineer. Seasoned executive qualified to develop and produce new products. Technically trained mechanical and metallurgical engineer. 47 years of age. 25 years practical experience. 16 years in responsible charge. Thoroughly familiar with modern production methods machine shop or foundry. Competent to supervise all details. Excellent references. Will travel anywhere. PW-910, American Machinist, 330 W. 42nd St., New York 18, N. Y.

CHIEF ENGINEER in plant employing 400 workers doing sheet metal stamping and automatic screw machine work, desires change. Prefer job in tool engineering line. Experienced in loyout, development, and building necessary tools for quantity production of numerous products made by present employer. Salary secondary to permanency and chances of advancement. Married, age 31, graduate M.E. Not afraid of work. Will stick to job until licked. Have only worked at one place since finishing school. Will be available February 1st. PW-916, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MECHANICAL ENGINEER, age 24, desires permanent position in charge of designing and building factory equipment. Will locate anywhere in New England. Ten years experience with two leading electrical manufacturers doing this type of work. PW-890, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W. Washington 5, D.C.

CONTRACT WORK

MANUFACTURING FACILITIES WANTED: Forging, cold-heading or punch press shop wanted to make several million pocket knife bolsters for us. Write for samples. Union Cutlery Co., Inc., Olean, New York.

TOOL DESIGNER WANTED

Man with experience in designing tools and fixtures for pressed metal parts and light machine work. Post War future assured. Excellent opportunity with a medium size progressive organization situated about 35 miles south of Boston, Mass. Write stating experience etc. to:

P-921, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

POSITION VACANT
CHIEF ACCOUNTANT

With C.P.A. experience or equivalent wanted, preferable having broad experience in machinery manufacture accounting. Unusual opportunity and future with progressive company having highest rating. Please give full information as to qualifications, age and compensation.

P-915, AMERICAN MACHINIST
330 W. 42nd Street New York 18, N. Y.

POSITION VACANT
Experienced Mechanical Engineer

Engineer wanted with wide experience in designing and developing light machinery. To be considered applicants must have had wide experience in Engineering and Development work and must be competent to direct and supervise all details.

An exceptional opportunity to become connected with a highly successful firm outstanding in its field; modern plant, up-to-date methods, and located in a large northeastern seaboard city, with attractive nearby suburbs, good homes and surroundings.

For consideration state in detail present position, past experience, education, age, and salary desired. Interview will be arranged; all corespondence will be considered strictly confidential.

P-908, American Machinist,
330 West 42nd St., N. Y. 18, N. Y.

POSITION VACANT
INDUSTRIAL ENGINEER

Wanted by old established company building high grade machinery. Plant and facilities are modern, surroundings and organization congenial. Splendid present and post war opportunity for the right man.

P-914, AMERICAN MACHINIST
330 W. 42nd Stoet New York 18, N. Y.

PRODUCTION ENGINEER

For well established, well equipped plant with young, progressive management and good post war setup. Product: Tools, such as wrenches, pliers, etc.

Must be thoroughly trained and have practical experience in jig and die design, plant layout, production control, time study, etc.

Located in city of 10,000 population, 75 miles from Minneapolis.

Permanent connection for right party—*Write*

OWATONNA TOOL COMPANY

OWATONNA, MINNESOTA

WANTED

Tool Designer - Mechanical Draftsman

A large and old established Chicago Company located on the West side has an opening for a tool designing engineer with practical mechanical experience in dies, jigs, and fixtures. Must be able once the new product has passed the experimental stages to design and decide what tools are needed for mass production in order to produce the product at minimum cost, capable of following the tools through the plant to see that tools are working properly when processing the parts. Please give age, nationality, previous experience, companies worked with and salary expected. Present employers will not be approached.

P-893, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

SALESMEN WANTED

Leading diamond tool manufacturer—nationally known and advertised, will engage one salesman for Southern Ohio and Indiana and one for Western Pennsylvania. Other territories also available.

We require men with knowledge of machine shop, precision grinding, etc. plus the personality and ambition to be successful. The accepted men will be supported and given intelligent assistance by a high grade engineering staff.

Send full details regarding your business experience. All replies held confidential and will be acknowledged.

SW-911, AMERICAN MACHINIST
520 North Michigan Ave.
Chicago 11, Illinois

A Brand New Machine—

NOT AN IMPROVEMENT

A machine that produces 100% accurate results at five times the speed of today's methods—Ready for manufacture—Demonstrating Units built. No experimental work. The first machine of its kind ever produced. Market covers every phase of industrial activity everywhere—Language & Customs no barrier to its acceptance. Should interest large scale operating Corporations looking for a product that has a continuous demand in a large enough volume to provide uninterrupted employment for at least 500 employees—Classification of manufacture Light. Correspondence invited preferably, tho not necessarily, from Companies having Foreign Plants and/or Sales Divisions.

BO-913, American Machinist
330 West 42nd Street — New York 18, N. Y.

SALES ENGINEERS TO INDUSTRY

DO YOU NEED sales engineers in the western New York, Pennsylvania and Ohio area? We, as an associate group of engineers embracing all technical fields, now offer our services as sales engineers to industry. The proper application of our resources and talents should bring about greater sales to more satisfied customers.

Manufacturers desiring representation in this area are invited to write for full information.

RA-920, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

TWIST DRILLS

Supervisor Mid-west Sales territory working with Manufacturers Agents. Willing to travel. Must have detailed knowledge of drills and high grade character references. Good salary plus participation.

ACE DRILL CORPORATION
DETROIT 27 — MICHIGAN

IF YOU ARE DOING DEFENSE WORK

Send for Our Latest Circular Covering Bargains in Small Tools Such as Drills, Reamers, Turret Attachments, etc.

DEWITT TOOL COMPANY
173 Grand St. — New York City

WANTED—To Manufacture and Sell
On royalty basis—Tools or specialties of recognized merit for the metal-working industry. Old established company with adequate production and distribution facilities including a dozen branch offices from coast to coast and established clientele.

W-912, AMERICAN MACHINIST
520 North Michigan Ave., Chicago 11, Ill.

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED
MHA MEMBER
JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

FOR SALE
Coulter Diamond Boring Machine

Vertical, single spindle, complete with 5 HP, 440 volt, 3 phase drive with starter and work hold down—can finish bore holes up to 4" dia. by 3" deep. Machine ready to run.

THE OHIO ELECTRIC MFG. COMPANY
CLEVELAND, OHIO

NEW INVENTIONS WANTED

A well organized plant specializing in machine and sheet metal products wishes to contact designers who have developed automotive and household items which will find a nation wide market.

PAUL WHITAKER
1235 South Gaylord — Denver, Colorado

FLATHER 16" x 6' Q.C.G. Lathe.
POTTER & JOHNSTON 15" Shaper.
28" Sliding Head, P.F., Drill Press.
BUFFALO No. 0 Vertical Bender, M.D.
MILWAUKEE No. 2-B double over-arm plain Miller, M.D.
Available immediately. Also many other tools.
ALEX ZEEVE & COMPANY
2269 Woolworth Bldg., New York 7, N. Y.

Before you buy, sell or exchange machinery of any kind contact us first
PAUL'S MOTOR & MACHINERY SUPPLY
MHA MEMBER
6111 Vermont Ave
DETROIT, MICH.

DON'T FORGET THE BOX NUMBER

When answering the classified advertisements in this magazine don't forget to put the box number on your envelope. It is our only means of identifying the advertisement you are answering.

1—#3 Baush Multiple Spindle Drill, drilled for 34 equipped with 24 spindles, diameter 1¼", #2 Morse Taper complete with 10 HP-440 V. motor. Machine in first class condition, recently rebuilt.

John Wood Manufacturing Company, Inc.
Conshohocken, Penna.

For Contract Work and Rebuilding Advertisements
See Pages 233, 240 and 241

HILL-CLARKE

Modernized

CYLINDRICAL GRINDERS for SUPER-GRINDING and MICRO-FINISH

SIZES AVAILABLE

10x36	14x36	16x30
10x50	14x50	16x50
10x72	14x72	16x72
10x120	14x96	18x96
		18x168

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke Patented Multiple V-Belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels.

Send for a copy of our catalog "Super Grinding."

HILL-CLARKE MACHINERY CO. CHICAGO U.S.A.

Have you any NORTON grinders you wish modernized and motorized?

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BOULEVARD **CHICAGO 6, ILL.**

ABSOLUTE PUBLIC AUCTION

TOOL ROOM, PRODUCTION AND FACTORY EQUIPMENT

MAJORITY INSTALLED NEW WITHIN PAST ELEVEN MONTHS!

$100,000.00 VALUATION!

Formerly Owned by U. S. INSTRUMENT COMPANY

***On the premises:* 421 WEST 54th ST., NEW YORK CITY**

TUESDAY, SEPTEMBER 12, 1944—at 10:30 A. M.

—PARTIALLY COMPRISING—

TURRET LATHES: (8) $5 Midland univ. geared head, 12 speeds, Timken bearing, motor in base, cap. 2"x21". (1 year old). (2) $3A Warner & Swasey, geared head, cap. 4"x25", V-belt, m.d. $2A Warner & Swasey, geared head, cap. 3"x18". $2 Warner & Swasey Hand Screw Machine. $2 Foster hand screw machine.

TOOLROOM LATHES: (2) 14"x6" Reed Prentice, model B. Geared head, 16 speeds, Timken bearing, motor in base (10 months old). (3) 16"x6' Porter McLeod, geared head, 12 speeds, Timken bearing, motor in base (11 months old). (2) 9"x48" Southbend, bench.

DRILL PRESSES: 2 & 4 spindle Walker Turners, 21" Excelsiors, Hi-speed, Henry & Wright.

ALSO: $4 Burke miller. (12) Double end electric grinders (from ½ to 3 HP), Toledo hack saw, Ingersoll & Monogram air compressors, Detrex degreaser, Westbrook marking machine, woodworking saw table, jointers, also: LUMBER.

$35,000.00 TOOL CRIB—MAJORITY NEW! INSPECTION DEPARTMENT: Large assortment of micrometers, surface gauges, dial indicators, height gauges, verniers, calipers, protractors, magnetic & parallel blocks, telescoping gauges, straight edges, Rockwell tester, surface plates, snap and plug gauges.

TOOLS: Large assortment hi-speed drills, milling cutters, taps, files, geom. die head, lathe chucks, drill chucks, lathe toolholders, saw blades, carbaloy, hi-speed tool bits, elec. drills, grinders, 50 vises, 300 new Ames collets.

FURNITURE & OFFICE EQUIPMENT: Complete executive offices, new desks, chairs, rugs, etc. 50 office & typewriter desks, 30 filing cabinets, elec. adding machines, 6 elec. water coolers, 75 factory stools, 500' glass & metal partition, mimeograph duplicator, bookcases, drafting tables, etc.

MISCELLANEOUS: 20 KVA Spot Welder, 19½ Inclinable Press, complete paint spraying room, 2000 new elec. bulbs from 15 to 200 W. 200 Fluorescent lights, 200 factory stools, new elec. motors, steel bar stock, and hundreds of other items.

EVERYTHING WILL BE SOLD WITHOUT RESERVATION IN PIECEMEAL LOTS

INSPECTION SEPT. 8th TO SALE DATE

A Complete Detailed Illustrated Circular Will Be Sent You Free on Request

For All Information Write—Wire—Phone:

Sale Under Management of **Industrial Plants Corporation** (Toledo, Ohio) (Pittsburgh, Pennsylvania)

90 WEST BROADWAY, NEW YORK 7, N. Y. **BArclay 7-4185**

EASTERN OFFERS FROM STOCK

Eastern Rebuilt Machine Tools

CYLINDER GRINDERS

No. 50 Head, m.d., hydraulic feed
No. 55 Heald, m.d.
No. 60 Heald, belt
No. 65 Heald, m.d.

VALVE SEAT GRINDER

Cincinnati Valve Seat Grinder, cap. ⅝" valve stems

CYLINDRICAL GRINDERS

10x120" Norton Type C Hydraulic, m.d., latest type
6x18" Landis Plain Self-Contained, m.d.
6x22" Norton Plain, m.d.
10x48" Brown & Sharpe Plain, m.d.
10x52" Landis Plain, m.d.
10x72" Landis Plain, m.d.
10x96" Landis Type C Plain Hydraulic, m.d., latest type
12x36" Cincinnati Plain, belt
12x36" Modern Plain, belt
12x36" Modern Plain, m.d.
12x42" Landis Plain, belt
12x48" Cincinnati Plain Self-Contained, 3 motor drive
12x48" Modern Plain, m.d.
14x18" Cincinnati Plain, m.d.
16x68" Landis Plain, m.d.
20x120" Landis Plain Self-Contained with 24" gap, swings 36" in gap, m.d.
36x96" Landis Plain Self-Contained, m.d.
16x40" No. 3 Landis Universal, motorized
16x68" Landis Universal, belt

DISC GRINDERS

No. 4 Gardner, m.d., with two 16" ring wheel discs
No. 20 Gardner B.B. Combination Disc Grinder and Roll Sander, with 30" disc

INTERNAL GRINDERS

No. 6 Bryant, belt
No. 10 Bryant, belt
No. 20 Bryant, belt
No. 72A3 Heald Sizematic, 2 motor drive

CENTERLESS GRINDER

No. 4 Cincinnati, m.d., latest type

SURFACE GRINDERS

36"x36"x18' Gray Planer Type Surface, m.d.
54" Bridgeport Knife, belt
14" Pratt & Whitney Vertical Surface, m.d.
No. 1 Fraser Lapper, 28" plate, belt

TOOL & CUTTER GRINDERS

No. 1 Cincinnati Universal, belt
Gisbolt Universal, belt
Gleason Cutter, belt
Gould & Eberhardt Gear Cutter Grinder, belt

HAMMERS

No. 400—400 lb. Bliss Board Drop
600 lb. Niles-Bement-Pond Steam
800 lb. Bement Single Frame Steam
1100 lb. Bement-Miles Single Frame Steam

ENGINE LATHES

13"x33' Schumacher-Boye, cone
13"x6' Willard Geared Head, m.d.
14"x6' American Geared Head, m.d. (3)
14"x8' Springfield Geared Head, m.d.
14"x8' Sidney, cone, m.d.
16"x6' Lodge & Shipley, cone
16"x8' Reed-Prentice Geared Head, m.d.
18"x8' Hendey Yoke Head, m.d., taper
18"x6' Hendey Yoke Head, m.d., carriage spacing attach.
18"x12' Boye & Emmes, cone, m.d.
19"x10' Sidney, cone, m.d.
20"x9' Lehmann Geared Head, m.d., taper
20"x10' LeBlond, cone
20"x11' Reed-Prentice Geared Head
23"x16' centers (22' bed) 100 H.P. Input American Super Lathe, p.r.t., 5 motors, weight 85,000 lbs.
27"x10' LeBlond Geared Head, m.d., taper
34"x10' Greaves-Klusman, cone, taper
34"x12' Schumacher-Boye, cone, m.d.
36"x12' Schumacher-Boye, cone, m.d.
27"x16' LeBlond, cone
30"x14' American Geared Head
30"x28' Greaves-Klusman, cone, m.d.
36"x10' Putnam, m.d.
36"x12' Wright, cone

Immediate shipment from stock. No priority needed.

The EASTERN MACHINERY CO
1004 TENNESSEE AVE
CINCINNATI 29, OHIO

. . . IN STOCK

AUTOMATICS

9/16" Davenport Model DA, five spindle
⅞ Cleveland Model M, four spindle
1¾" Gridley Model F, four spindle
3¼" Cleveland Model M, single spindle

DRILLS

No. 14 Natco Multiple Spindle
No. 11 Natco Multiple Spindle
24" Barnes Camelback, four spindle
20" Barnes Camelback, two spindle
Avey Sensitive, four spindle
No. 310 Baker, single spindle
25" Superior Sliding Head, single spindle
24" Barnes Camelback, single spindle
4 ft. Dreses Radial, s.p.d.
3 ft. Prentice Radial, s.p.d.

GEAR CUTTERS

No. 5—60" Brown & Sharpe
No. 3—36" Brown & Sharpe
No. 6 Fellows Shaper, m.d.
No. 13 Brown & Sharpe
No. 12 Barber Colman Hobber
96" Gleason Spur & Bevel Gear Planer

GRINDER

No. 72A3 Heald Gagematic
No. 75 Heald Internal
No. 3 Landis Universal
10 x 24 Norton Cylindrical
10 x 50 Norton Cylindrical
30" Diamond Face
No. 14 Pratt & Whitney Surface
No. 2 Wilmarth & Norman Surface
No. 12 Brown & Sharpe Cutter

LATHES, ENGINE

14 x 6 Lodge & Shipley, q.h.
14" x 8' Reed Prentice, q.h.
16" x 6' Hendey, c.d. Tie bar
20" x 12' Lodge & Shipley, c.d.
26" x 16' Lodge & Shipley, c.d.
29" x 14' Schumacher, Boye & Emmes c.d.
8" x 60" Fitchburg Lo-Swing, q.h.

LATHES, TURRET

No. 3A Warner & Swasey, q.h.
No. 2A Warner & Swasey, q.h.
26" Libby q.h.
No. 5A Potter & Johnston
No. 4 Millholland, c.d.
No. 2 Brown & Sharpe
24" Bullard Vertical, New Era

MILLS

No. 2A Brown & Sharpe Universal s.p.d.
No. 3 LeBlond Universal, c.d.
No. 1 Cincinnati Plain, c.d.
Model C Becker Vertical, s.p.d.
No. 5 Becker Vertical c.d.
144" Betts Vertical Boring, m.d.
42" Bullard Vertical Boring, m.d.

MISCELLANEOUS

16" Betts Slotter
Wicaco Oil Groover
No. 3 Eclipse H. S. Furnace
No. 6 Whiting Stake Riveter
Betts Profiler, two spindle

PLANERS & SHAPERS

96" x 96" x 25' Detrick & Harvey Open-side Planer, 4 heads
48" x 48" x 12' Cincinnati Planer, 4 heads
32" x 32" x 10' New Haven Planer, 1 head
24" x 24" x 8' American Planer, 1 head
32" Cincinnati Shaper, c.d.

Complete Facilities for REBUILDING and MOTORIZING Your Old Machine Tools

WRITE, WIRE or PHONE US

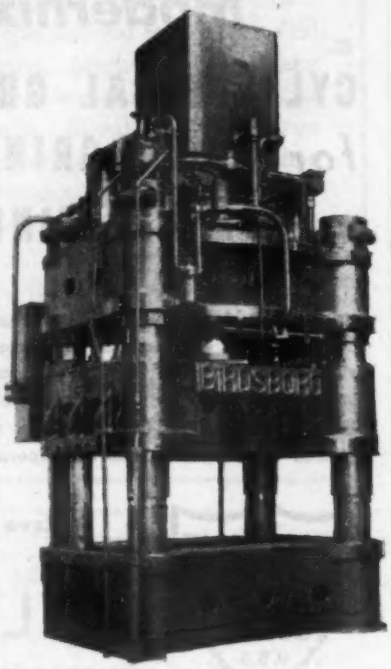
INDIANAPOLIS MACHINERY & SUPPLY CO., INC.

1959-1969 South Meridian Street
INDIANAPOLIS 6, INDIANA

Eastern Branch:
44 WHITEHALL STREET, NEW YORK 4, N. Y.

600 TON BIRDSBORO

HYDRAULIC PRESS



High speed, 28" downward moving ram, 70" x 60" platens, 36" opening, 18" stroke with 125 H.P. Aldrich Vertical Triplex Motor Driven Hydraulic Pump. Capacity 75 G.P.M. — 2000 lbs. per square inch.

Also

150 TON STEAM HYDRAULIC

FORGING PRESS

"C" frame, made by United Engineering and Foundry Co.

IF YOU HAVE A HYDRAULIC PROBLEM WRITE TO US

WE PURCHASE YOUR SURPLUS EQUIPMENT

Specializing in — Hydraulic Equipment, Presses, Pumps, Accumulators

AARON MACHINERY CO.
MDNA MEMBER
45 CROSBY ST., NEW YORK 12, N.Y.

"FALK" for DEPENDABILITY in Rebuilt Machinery

Better performance, quantity and quality of work can be obtained by installing "FALK" GOOD USED MACHINE TOOLS on the job because:

"FALK" STOCK — A modern stock, with every item owned by "FALK" and in our warehouse or enroute. Shipments can be scheduled because "FALK" owns the machines. "FALK" critical inspection is given to every stock item.—Your inspection is welcome under ideal conditions for selecting machine tools.

"FALK SELECTIVE BUYING" — Each "FALK" used machine tool represents our investment of experienced judgment and capital. The high quality of "FALK" equipment reflects the distinct advantage of this policy, with money savings to you.

"FALK" FACILITIES — Modern facilities to operate, rebuild and inspect used machine tools are provided to assure successful operation. Experienced personnel under supervisors with years of experience in our organization.

"FALK" DELIVERY — Time saving delivery schedules arranged and maintained. Convenient warehousing and every required transportation facility.

"FALK" is a responsible source of supply of GOOD USED MACHINE TOOLS. Prices that are low, consistent with quality. Deliveries as promised, with satisfaction guaranteed. Facilities may be expanded or additional production secured NOW with "FALK" equipment at minimum cost and with maximum results.

GOOD BUYS FOR THE MODERN SHOP* — IMMEDIATE DELIVERY

SHEARS

Ohl 10', 10 ga. American 12' x 5/16.

PRESSES

#4 Bliss D.C. B.G. Forging 4" stroke.
#4½ Bliss D.C. B.G. Forging " stroke (2).
#4½ Bliss 3 column B.G. 3" stroke
5 Bliss D.C. B.G. Forging 3" stroke

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
Vertical, 48" Gisholt.
Vertical, 52" and 60" Colburn.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72" x 120".

DRILLING MACHINES

Weigel 22" backgeared, sliding head, tapping attachment, power feed.
Superior 26" backgeared, sliding head, tapping attachment, power feed.
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.

RADIAL DRILLS

5' Arm 11" Rd. Col. Cincinnati Bickford.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
7' Arm 13" Col. Cincinnati Bickford
4'11" Col. Cincinnati Bickford

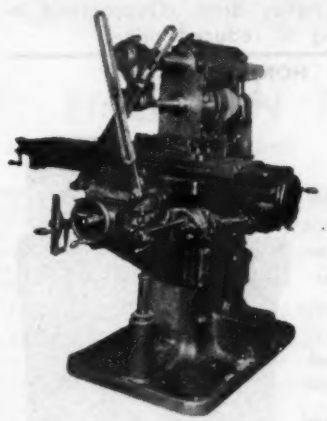
MULTIPLE DRILLS

Fox #15H 54 spindle hydraulic feed.
Fox #D-31 24 spindle motor drive.
Natco #D-5 8 spindle #1 M.T.
Boley Multiple adj. spd. ¼" cap. ar. M.D. —Arr. 10 spindles, equipped with 6

GRINDERS

16" Heald Rotary Surface Grinder.
12" Persons-Arter Rotary Surface Grinder.
12" Heald Rotary Surface Grinder equip with 9" Dia. Perm. Mag. chuck.
#2 Cincinnati Centerless Grinder, Filmatic.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump.
Oliver Model 51 Drill Grinder; 1½" cap.
#2 Brown & Sharpe Plain Milling Machine Range—28" Longitudinal travel
10" Cross travel 19" Vertical travel
Table working surface 10" x 45"

MILLING MACHINES



No. 5 Cincinnati, High Power, Plain, S.P.D.
No. 4 Cincinnati, High Power, Plain, S.P.D.
No. 3 Cincinnati, High Power, Vertical.
No. 2 Cincinnati, High Power, Plain.
No. 2 Cincinnati, Motorized, Pyramid Col.
No. 2 Brown & Sharpe, Plain (10).
No. 1½ Brown & Sharpe, Plain (2)
#1 Kempsmith Universal, Cone Drive.
#2 Brown & Sharpe vert., single pulley dr.
No. 1½ Valley City Universal, Cone Dr.
No. 1 Brown & Sharpe, Plain (6).
No. 12 P & W Lincoln Type Production (2).
No. 0 Bickett Vertical Bench Miller.
Ames Precision Universal Bench Mill.
P & W 2" Duplex Spline Miller.
Hall Planetary Thread Miller 24"
No. 8 Lees Bradner Thread Miller.

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.*
72"x72"x18' Pond Heavy Pattern, 4 Heads.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x36" Niles-Bement-Pond, Planer Shaper, M.D.

LATHES

South Bend 16" x 6' Motorized Gap Lathe.
Putnam 26 x 12 Heavy QCG, arr. for M.D.
American, 16 x 6 Q.C.G.
Hendey, 16 x 10 Q.C.G., Turner M.D.
American 16 x 6.
Potter & Johnston #6A Automatic, 3½" dia. hole in 5¾" Spindle. (2).

SHAPERS AND GEAR CUTTERS

14" Steptoe, M.D.
16" Queen City, M.D.
7" Rhodes Horiz. High Speed, Belt Dr.
26" Cincinnati Triple Geared Belt Dr.
#612 Fellows 36" Gear Shapers, (2)
12" Schuchart & Schutte Gear Hobber.
2 — #3 Barber Coleman Gear Hobbers, Serial Nos. 111 and 579.

MISCELLANEOUS

Lakewood High Lift Truck, platform type, 4000# capacity, less batteries.
J. C. Miller Co. Lacq. Heater with acquistat.
Heat Treating Furnaces for the tool room, all sizes.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
50 K.W. Moesta Gun Welder Transformer, portable, 25 cy. 440 volts.
Grinding Wheels for #2 centerless 4" face, 20" diameter.
Bertsch 3"x3"x⅜" angle bending roll.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 8 to 125 lbs. steam, delivers 9 gallons per minute.
Niagara #98 Brake & Folder, 72 cap. 14 ga arranged M.D.
#228C Greenlee Vert. Hollow Chisel Mortiser, Power feed, M.D.

HEADQUARTERS FOR POWER PRESSES

**The above list, selected from our current stock, is subject to prior sale or subsequent additions. Hence we urge your prompt inquiries on any of these machine tools or others in which you are interested.*

Buy from Stock

MACHINERY

Tel. Main 6347-6348

FALK

MACHINERY CO.,

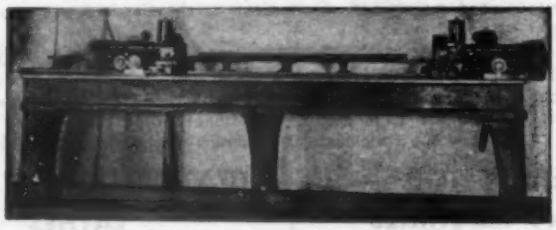
18 WARD ST.

MERCHANTS

ROCHESTER 5, N.Y.

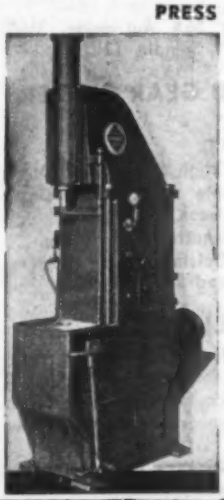
SPECIAL OFFERINGS
BY
MARKS MACHINE TOOL CORP.
60 FRANKLIN STREET — WORCESTER 8, MASS.

WHITON 2 x 8 x 96 DOUBLE HEAD 2-SPINDLE CENTERING MACHINE



This featured Centering Machine is single pulley drive. Guaranteed in good operating condition. Offering at reduced price.

LAPOINTE VERTICAL HYDRAULIC PRESS



5 and 6 ton capacity

CONSTANT or VARIABLE SPEED for PUSH BROACHING and GENERAL PURPOSES

•

Featured machine fully equipped with all electrical equipment 3-60-220-440.

HONING MACHINE

Hydraulic micromatic honing machine as featured with electrical equipment

Like new!

Priced Reasonably

No. 16 Brown & Sharpe 12x72 PLAIN GRINDER

Equipped with center rests and back rests, oil pump and all standard tools and wrenches. Overhead drive.

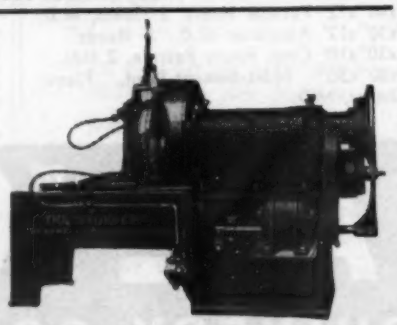
Machine in extremely favorable operating condition

CALL, WRITE OR WIRE FOR YOUR OPTION
$$$ SAVED ARE $$$ EARNED $$$

4" STOEVER PIPE THREADER

with complete set of dies, including oil pump

Priced Reasonably!



AIR COMPRESSOR
Chicago pneumatic, double stage 16½x12 GC-B.

WHEN YOU THINK OF GOOD VALUES IN USED MACHINES THINK OF MARKS

CLOSEOUTS

BORING MILLS
VERTICAL
66", 120" Niles
42" Bullard, turret head, swivel head
54", 62" Colburn, M.D.

HORIZONTAL
2½" Universal, Binsee
4" Dietrich & Harvey Floor, M.D.
4", Binsee, 4½" Bement-Niles

TURRET LAHES
No. 2A, 3A W. & S., 4¼" hole
26" Libby 7½" hole, 18" Libby, 3½" hole
24" Gisholt, 6⅛" hole
Foster Nos. 4, 5, 6, 1B, M.D.
W. & S. Nos. 2, 4 Universal, M.D.
J. & L. 2¼x24", 3¼x36"
Acme 3¼x36" grd head

GRINDERS
P. & W. 14", 18", B.B. Vert. M.D.
Blanchard 26", 30", M.D.
Modern 12x48", M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 55, 70, 72A Internal, M.D.
Norton 50" x 28", M.D.
Gardner 72" Disc, M.D.
Landis 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.

LATHES
14"x6' Sebastian Grd Head
48"x12' Harrington Gap, Sld Bed.
McCabe 26-42"x14'
26"24' Putnam 3 step cone, D.B.G.
24"x12' Boye & Emmes, 3 step cone, D.B.G.
20"x14' Rahn-Larmon, raised to 24"
16"x8' Lodge & Shipley Grd Hd, taper M.D.
14"x6' Hendey, tie bar, taper
14"x6' Mulliner, taper, collets
9" LeBlond Automatic

AUTOMATICS
New Britain 1⅝"x7" 6 spindle, Timken bearings
Cleveland Model A, ½", ⅝", 1¼", 2"
Cleveland Model B, 1", 2"
Gridley 1¼", 2¼", 4 spindle
Cleveland ⅞", Model M, 4 spindle
Gridley 4¼", single spindle, M.D.
B. & S. Nos. 00, 0G, 2, 2G
P. & J. No. 6A, M.D.
National-Acme Model C, 1⅝", 8 spindle, M.D.
No. 1 Petermann

GEAR CUTTERS
No. 8, 12 Barber-Colman Gear Hobber
No. 6 Fellows Gear Shapers
B. & S. Nos. 3-26", 4-36"
Gleason 11" Bevel

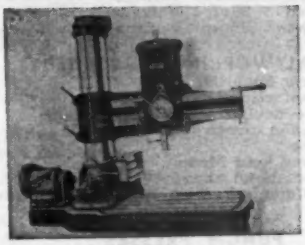
MILLING MACHINES
No. ½ Van Norman
10" P. & W. Automatic
No. 2A Milwaukee, S.P.D.
No. 3S Cincinnati, S.P.D. rapid traverse, M.D.
Nos. 0Y, 1Y, 3, 4, 5, B. & S. Plain & Univ.
B. & S. No. 12, 13, 13B
Hall Planetary Model D Thread Miller
Providence Planer Type 32"x8'
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4 Cincinnati Vert.
P. & W. No. 12 Profiler, M.D.
No. 2—Kent-Owens

RADIALS
4' American Triple Purpose
8' American Triple Purpose, M.D.
5' Dreses, Full Universal
3', 3½' Cincinnati-Bickford
4' Mueller, M.D.
4', 5' Western, S.P.D.

MISCELLANEOUS
6 spindle Avery Drill, 18" overhang
300 ton coining press, McCabe ¼" Flanger
Rochester No. 5B High Speed Hammer
Pels 6' Throat Punch, Pottstown Tappers
P. & W. 6" Vert. Shaper
Marvel Metal Band Saw, M.D.
Pipe Machines, 2", 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
No. 30 Natco Multiple Spindle Drill
150 ton United Steam Hammer
Thompson-Gibbs Spot Welders 17 KVA
Anderson Tapper, No. 23A, Quickwork Rotary Shear
6x80" Pratt & Whitney Thread Miller

AARON MACHINERY CO.
MONA MEMBER
45 Crosby St.
New York 12, N. Y.

Ok'd by Botwinik for Immediate Sale



5' TRIPLE PURPOSE RADIAL DRILL (American)

Greatest distance from spindle to base, 5'6". Range of spindle speeds, 17.5—575. Range of feeds, .005//.040. Morse Taper in spindle, No. 5. Drills to center of circle outside of column, 10'. Traverse of spindle, 18¼". Traverse of head on arm, 52". Traverse of arm on column, 38". 32 Speeds.

5' CINCINNATI-BICKFORD REGULAR PLAIN RADIAL DRILL

Cap. vert. range of arm 3' 4¾". Horizontal range of head 4'3". Max. dist. under spindle over base 5'9½". Drills in plane of base to center of 10'. Dia. of column 13".

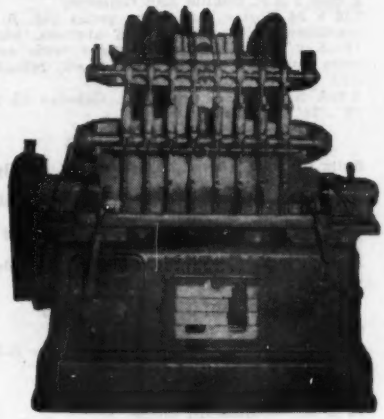
6' CINCINNATI-BICKFORD REGULAR PLAIN RADIAL DRILL

Cap. vert. range of arm 3'10". Horizontal range of head 5' 3". Max. dist. under spindle over base 6' 6". Drills in plane of base to center of 12'. Dia. of column 15".

Send inquiries — large stock to quote from.

Botwinik Brothers of Mass. Inc.
3 SHERMAN ST. WORCESTER 1, MASS

SCHRANER Crankshaft LAPPER



Maximum Swing 8".

Maximum distance between centers 41".

Minimum distance between any two arms 4⅛".

Maximum distance between outer arms 41".

Arranged for motor drive in the base with motor.

This machine is now equipped with 8 arms. By increasing or decreasing the number of arms, many types of crankshafts, camshafts or straight shafts may be precision tapped.

Available for inspection at our Chicago warehouse

EMERMAN MACHINERY CORP.
875 West 120th Street — Chicago 43, Ill.

1 — used Watson Stillman 600 ton single opening hydraulic press 16" dia. ram by 21" stroke downward acting, 48" daylight opening 31" bottom bolster complete with pumps and motors.

Universal Hydraulic Machinery Company
CAnal 6-9228 — 283 HUDSON STREET
WAlker 5-5333 — NEW YORK 13, N. Y.

1—No. 5 Cincinnati Plain Mill, S.P.D.
3—Barber-Colman, Type 5, Gear Hobbers, M.D.
2—J & L 6" x 15" Plain Thread Grinders, M.D.

MONA MEMBER

D. E. DONY MACHINERY CO.
47 Laurelton Road, Rochester 9, N. Y.

LEVELLING ROLLS

54"x4¼" McKay, 17 rolls of tool steel, with unit adjustment, arranged for motor, including pinion. Condition excellent.

TURRET LATHE

#1-A. Warner & Swasey Geared Head for motor drive, with bar equipment, rated capacity 2½"x35". Serial #269958. Very good condition.

GALBREATH MACHINERY CO.
Empire Building, Pittsburgh, Pa.

MILLING MACHINES

#2 Jackson Vertical Miller, M.D.
#3H K & T Sliding Head Vertical Millers, M.D.
1—5' American triple purpose plain radial drill, motor on arm.
#4 Cincinnati High Power Plain Miller, S.P.D.
#4 Cincinnati Vertical Miller, H.P.S.P.D.
6' American Triple Purpose Plain Radial Drill, M.D.

GRINDERS

Lees Bradner Gear Grinder.
Simplicity Piston Grinder.
12" x 96" Landis Plain, S.C.

GEAR MACHINERY

18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
#4—36" B & S Automatic Gear Cutter.
Lees Bradner Gear Grinder.
#8 Fellows Gear Shaper, Cone.
#2 Pfauter Gear Hobber.
36" Gould & Eberhardt Automatic Gear Hobbing Machine, Motor driven.

PLANERS

42" x 42" x 20' Cincinnati Hypro, 4 Heads, D.C. drill.
24" x 24" x 6' Gray Planer.
26" x 26" x 8' Woodard & Powell, 2 Hds.

MISCELLANEOUS

14" Niles Slotter.
#4 La Pointe Broach

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second St., Cincinnati, Ohio

15 - ARTER ROTARY Surface Grinders

8" Capacity Motor Drive

Late Type — Guaranteed Condition

MOREY MACHINERY CO., Inc.
410 Broome St., New York 13, N. Y.

84" LATHE N. B. P.

28' Long, 17' Centers

72" geared face plate DC drive

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N. Y.

PRACTICALLY NEW WHITING

Overhead Electric Traveling Crane
Totally enclosed for outdoor service
150 Ton Capacity Main Hoist
2-25 ton each auxiliary hoists
5 motor, cab controlled, 3/60/440
Each hoist independently operated by means of separate electric control 30' span

IRON & STEEL PRODUCTS, Inc.
13498 S. Brainard Ave.
Chicago 33, Ill.
"ANYTHING containing IRON or STEEL"

PIPE New & Reconditioned

ALL SIZES for ALL PURPOSES
Cut and Threaded to Your Specifications
VALVES AND FITTINGS
UNITED PIPE & SUPPLY CO., NORRISTOWN, PA.

EXCEPTIONALLY FINE MACHINE TOOLS

AUTOMATIC AND HAND SCREW MACHINES

2—⅞" Model G Gridley Automatic, Four Spindles
2—#00 Brown & Sharpe Turret Formers
*1½" Cone Automatic, four Spindle
1¾" Cleveland Automatic, single spindle
1⅞" Acme Turret Lathe, power-fed turret
*#4 Warner & Swasey Hand Screw Machine
*#3 Bardon & Oliver Turret Lathe, new in '43, lot of extras
2—6¼" Univ. Gisholt, 48" O.D.

GEAR MACHINERY

*#17 Barber Coleman Gear Hobber
*3—#12 Barber Coleman Gear Hobbers
*12" Fellows Gear Shaver
*2—#6 Fellows Gear Shapers
*4—#7 Fellows Gear Shapers
*#40 Gross Gear Tooth Rounder
*#3 LaPointe Screw type Broach
2—11" Gleason Bevel Gear Cutter
36" Brainard Universal Gear Cutter (automatic)

DRILL PRESSES

*Footeburt Drill Press, Single Spindle with multiple heads (four), #4 M.T.
3' American Radial Drill
*Drill Press, 2 spindle, #2 M.T.
Barnes, #3 M.T., complete, brand new 3 jaw chuck, single spindle

GRINDERS

*Kwik Way O.D. Grinder, new in '41, with motor
#2 Brown & Sharpe Universal Grinder, with motor
1½ Cincinnati Cutter Grinder, with motor
2 and 3 H.P. Double End Grinders
*10 x 24 Norton O.D., nine years old, A-1 condition, with motors and starters, etc.
*2—Sav-Way Internal Grinders with excello spindles, motors, hand feed, rebuilt and guaranteed
#30A Brown & Sharpe O.D. Grinder 12 x 18", 24" wheel with motor

TOOL ROOM LATHES

Spitz 14" x 36" Bench Lathe, chuck, steady rest, etc. A-1 Condition
American Geared Head 16 x 6', quick change gear, A-1 condition
New Haven 18" x 8', loose change gear
50" x 11½' loose change gear lathe
24"x17' lathe, loose change gear, 7" hole in spindle, all complete, A-1 condition

MANUFACTURING LATHES

8" Porter Cable Production Lathe
*14" Faye Automatic, all complete, A-1 condition
*18" Faye Automatic, all complete
Sunstrand Stub Lathe, 6" swing
18 x 60" Crankshaft Lathe

MILLING MACHINES

#4 Milwaukee Horizontal Mill
2—Lees Bradner Thread Millers
Osterlein Rotary Mill 48"
#3 Brown & Sharpe Horizontal Mill

Combination Milling & Drilling Machine, 2 Drilling Spindles, 1 Milling Spindle.

*#3 Cincinnati Universal
#2 Brown & Sharpe Vertical
#2 Brown & Sharpe Universal
#2 Brown & Sharpe Horizontal

METAL WORKING MACHINERY

5' Niagara Squaring Shear
23" throat circle shear
2" stroke double end punch machine
Combination punch and shear, 12 x 12 die space
#101 Hand Leaf Brake
18" throat hand shear
*Metal Cutting Verticle Band Saw, large size

PUNCH PRESSES

*Elmes Hydraulic 350 ton, with motor
*Stoll straight side double action mechanical press 275 ton, with motor
DDG Ferracute Punch Press, approx. 85 tons, straight side
Hydromatic, 18 position spot welder, less than 8 years old, 50 KVA

MISCELLANEOUS

*16" Smith & Mills Shaper, A-1 condition
1½" Acme Bolt Threader, double spindle
2—Car Wheel Borers, 24" and 48"
*48" x 8' P & F Machine Planer
24" Beaders & Slotter
*Schraner Polisher & Finisher
2 Spdl. drum type tapper, size ⅜"
Brand new "Clark" Rockwell Hardness testers
*Pilton Crane Slotter
*Tinius Olsen Horizontal Balancer & Tester
96 to 1 Palmer Bee Speed Reducer
500 G.P.M. Dayton Turbine Pump
50 lb. Mayer Trip Hammer
6 H.P. Gas Engine 1450 RPM
38" Riveting Machine, revolving table

*Machines marked with asterisk are all complete, brand new motors, controls, and are in excellent condition. They may be inspected under operation.

Paul's Motor and Machinery Supply Co.

MDNA MEMBER

6111 VERMONT AVE., DETROIT 8, MICH.

PHONES: TYLER 763000-2. GET MY PRICES BEFORE YOU BUY OR SELL

GEAR MACHINERY

9" Pratt & Whitney Gear Grinder, M.D.
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper, M.D.
Cimatool Gear Chamfering Mach., M.D.
Lees-Bradner Gear Grinder

SHAPERS—PLANERS

18"x18"x4' Whitcomb Planer
36"x48"x12' Cinc. Hypro. Planer, 4 hds.

MILLERS

Model L. T. 6"x36" Lees-Bradner thread miller, latest type
No. 25-B Defiance Hor. Bor. Mill 3¾" bar, New 1941
No. 1—12" and 1—18" Cincinnati Plain Automatic millers latest type (19)
No. 2 Cincinnati Vertical Miller, Dial Type (11)
New No. 3 Wigglesworth
4" Taylor & Fenn Duplex Spline

GRINDERS

No. 2 Cincinnati Centerless (1941)
10"x210" Landis Pl. Grindor—latest type
No. 35 Gallmeyer & Livingston Hydraulic Surface grinders, latest type (6)
10"x120" Norton Type C Grinder—latest type
12"x120" Landis Pl. M.D.
No. 10 B & S Plain Grinder, M.D.
No. 3 Osterlein C & T Grinder

LATHES—TURRET LATHES

6"x6½" Goss & DeLeeuw Chucking Machine
No. 5 Jones & Lamson
No. 6R Cincinnati Acme
24" Bullard Vert. Turret, Hi-Speed

MISCELLANEOUS

No. 2L Lapointe Hydraulic Broach
No. Ajax Forming Roll
No. 21-SA Cochrane-Bly H.S. Saw
No. 171 Bliss Stiles Serve Cutter
New Delta Drilling Equipment

WIGGLESWORTH MACHINERY CO.
203 Bent St., Cambridge 41, Mass.

3' American Radial Drill, Triple purpose, 24 speeds, m.d $1500
Detroit Hardness Tester, new 1943 with Brinell microscope $450
14"x6' Hendey Yoke Head, Q.C.G. Lathe, taper attachment, draw bar and collets, m.d. & motor. Complete $1350
No. 33 Abrasive Surface Grinder, Vertical, S.P.D. M.D. $850

Mandel-Camos Machinery Co.
805 West Lake St., Chicago 7, Ill.

MACHINE TOOLS

Excellent condition!

No. 4 Portage Horizontal Boring, Drilling & Milling Machine
5' American Plain Radial Drill
Thompson Universal Grinder, 12" x 30"
3⅞" Niles Bement Pond horizontal Boring Bar

ALL MOTOR DRIVEN

(Write for complete detailed specifications!)

Iron & Steel Products, Inc.
13498 S. Brainard Ave., Chicago, Ill.
"Anything containing IRON or STEEL"

MISCELLANEOUS MACHINES

48"x36"x16' Gray Dbl. Housing Planer, 3 hds., 15 HP, A.C. md.
48"x48"x14' Gray Dbl. Housing Spur Grd. Planer with 4 hds., incl. 25 HP, A.C. motor.
12"x18" Cincl. Plunge Cut Grinder, A.C. m.d., 20x8" face wheel, rebuilt.
3¼" bar Morris Horiz. Boring Mill, m.d. with 4 bars.
6' Niles Pl. Radial Drill, A.C., m.d., Rebuilt.

STRONG, CARLISLE & HAMMOND CO.
1392 West 3rd St., Cleveland, Ohio — 2832 E. Grand Blvd., Detroit, Michigan

---

SHEET METAL MACHINERY

NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders

LIMA MACHINE

B. D. BROOKS, INC.
391 Atlantic Ave., Boston, Mass.

4' Universal Radial Drill, B.D.
D-4 Colburn H. D. Drill, #5 M.T.
#14 Cochrane-Bly Vert. Miller & Shaper, M.D.
12" x 32" Landis Universal Grinder.
#3 B&S Vertical Miller, S.P.D.
20"-24"-32" Shapers.
10' Bridgeport Knife Grinder.
36" Morton Draw Cut Shaper.
No. 3 Catlin Keyseater 25" x 2", M.D.

West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

MOREY

Dependable Used Machines

DEFIANCE No. 25A Horiz. Boring Mill, 3¼" bar—Built in 1941

N.B.P. 48"x36"x14' Planer; 3 heads; box table; belt drive

GRAY 72"x48"x12' Planer—two heads; belt drive

HAMILTON 42"x42"x20' Planer; 3 heads; DC motor drive

LUCAS 3" bar Horiz. Boring Mill, M.D.

AMERICAN 5' Radial Drill—motor on arm; triple purpose

NATCO C-13 Hyd. Mult. Spindle Drill

LANDIS 20"x220" Plain Grinder; M.D.

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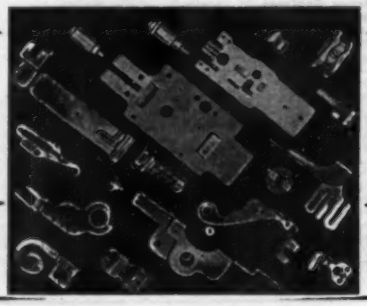

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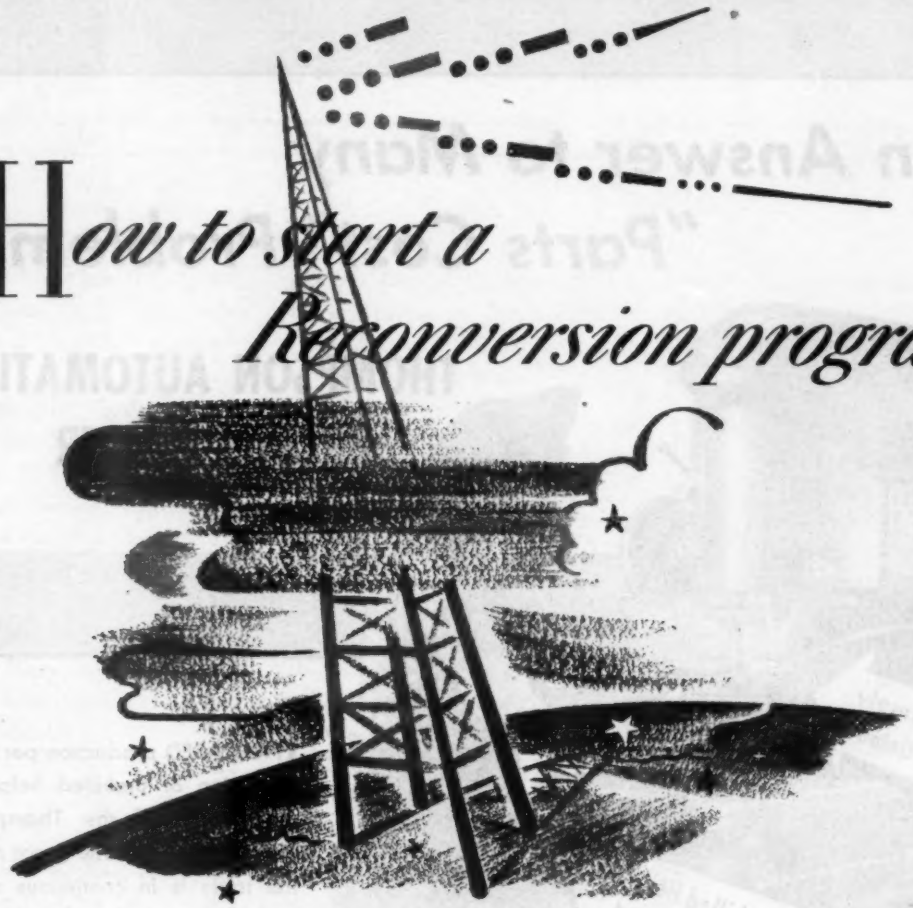

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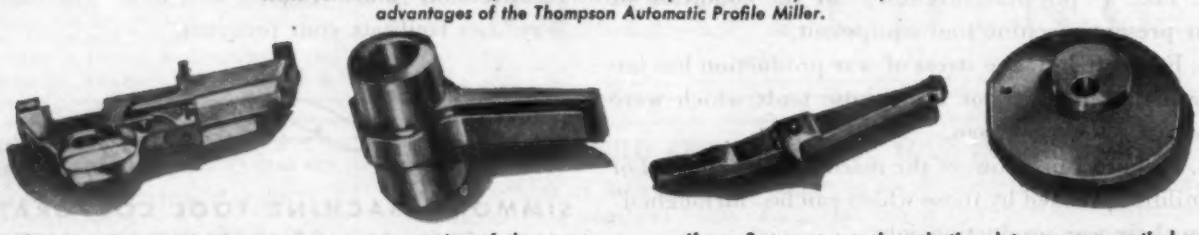

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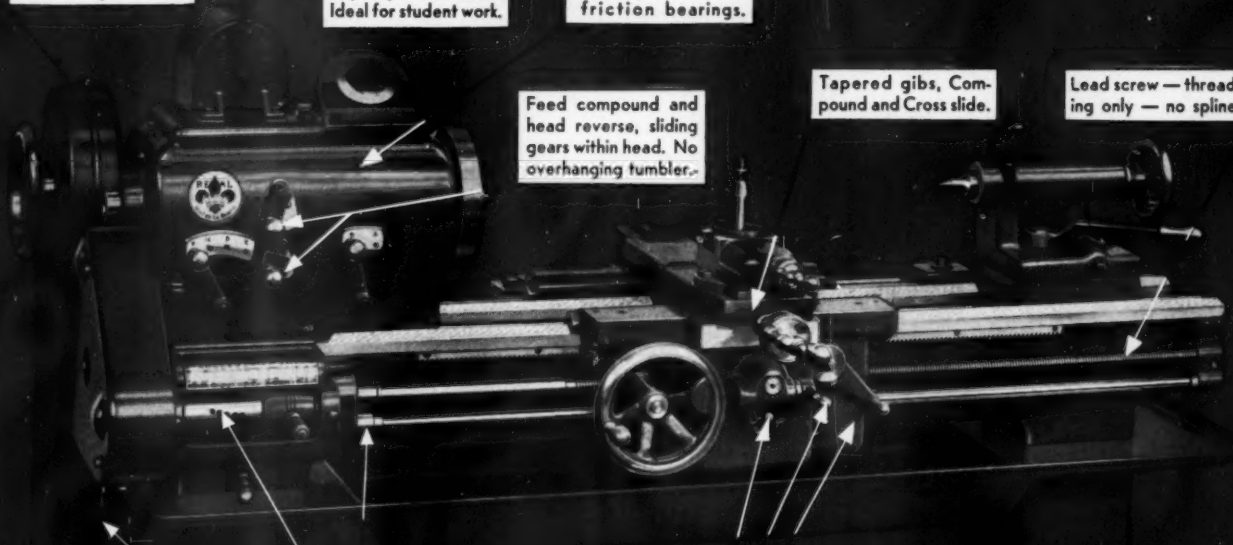
AMER. MACH. —12707— Aug. 31

A Smooth Performer

LEBLOND SUPER REGAL



Self-contained V belt motor drive. No flat belts. No jack shafts.

Forward-Reverse Jog.

Rapid speed selector. Ideal for student work.

8 Geared Speeds in Oil. Quiet operating steel gears. Anti-friction bearings.

Feed compound and head reverse, sliding gears within head. No overhanging tumbler.

Tapered gibs, Compound and Cross slide.

Lead screw — threading only — no spline.

Safety clutch — Not a shear pin.

One-shot oiling. Front and rear to carriage ways and underside of cross slide.

Rectangular box casting apron. Steel gear anti-friction rack. Pinion bearings.

Full range feed box. Steel gearing. Central oiling.

Single positive clutch control for either cross or longitudinal feed — no frictions.

Motor on hinged plate for belt tension. Low center of gravity.

See them — Most any Defense Plant — Many Vocational Schools, or wherever efficiency in turning is required.

Storage space in cabinet leg.

Pan and cabinet leg optional.

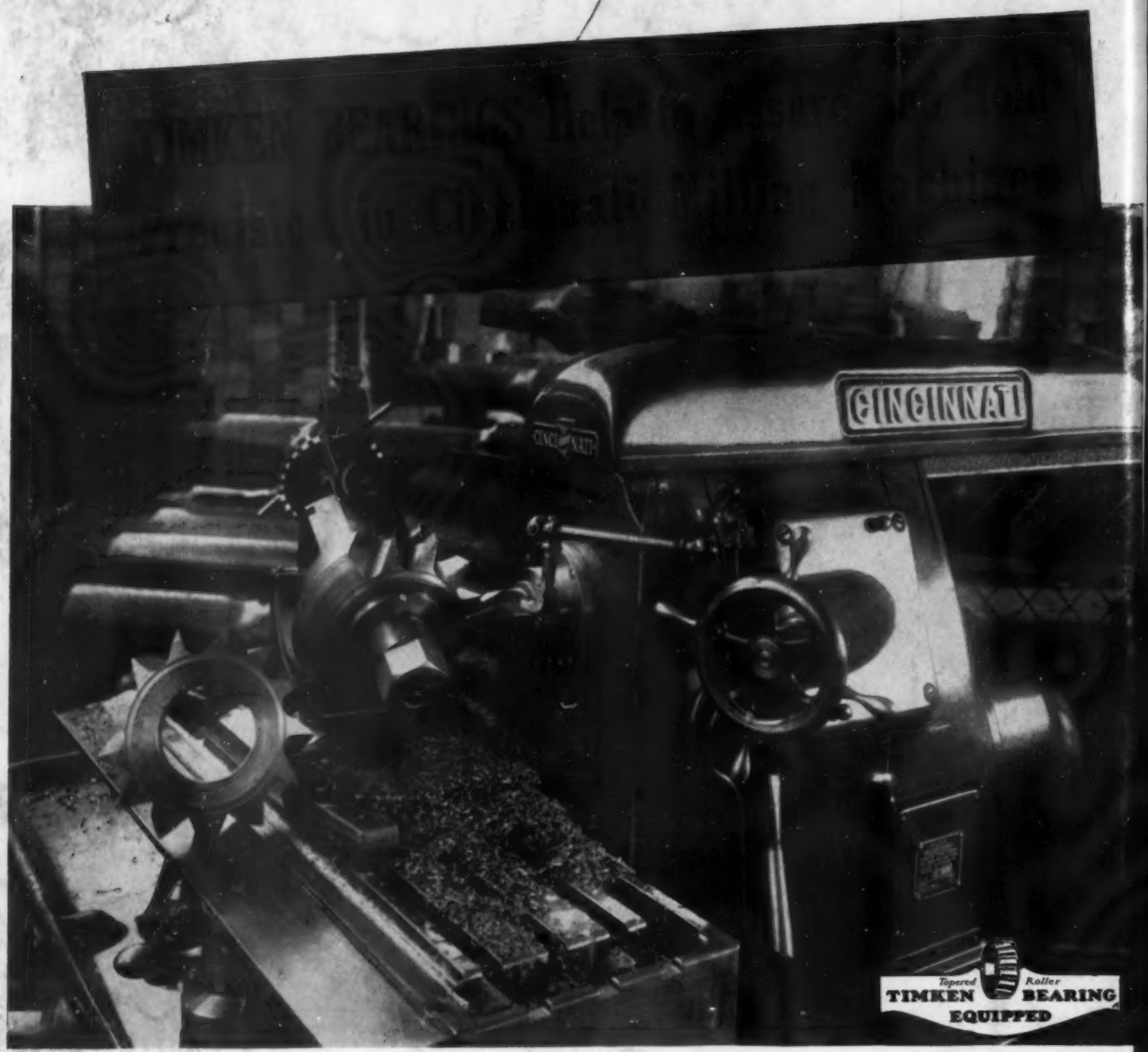
ARMY E NAVY

R.K. LeBLOND MACHINE TOOL CO., CINCINNATI, 8

NEW YORK 13
103 Lafayette St
CAnal 6 5281

CHICAGO 6
20 N. Wacker Dr
STA 5561

LEBLOND



Shown in the photograph is a Cincinnati No. 1-12 Plain Automatic Milling Machine set up to machine the cutter of an oil well bit.

THIS machine is equipped with Timken Tapered Roller Bearings on the spindle and spindle drive — vital points of precision. Timken Bearings also are applied on the table lead screw and some of the feed drive shafts.

The manufacturer, The Cincinnati Milling Machine Co., has used Timken Bearings consistently for many years and knows their worth — and so do the equipment users. The Timken Roller Bearing Company, Canton 6, Ohio.

Material:	4815 steel.
Operation:	Mill out teeth from solid.
Cutting Tool:	$1\frac{15}{16}$" O.D. end mill, $\frac{7}{16}$" radius at point, 55° included angle.
Speed:	380 r.p.m.
Feed:	¾" per minute.
Depth of Cut:	$1\frac{3}{8}$".

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS